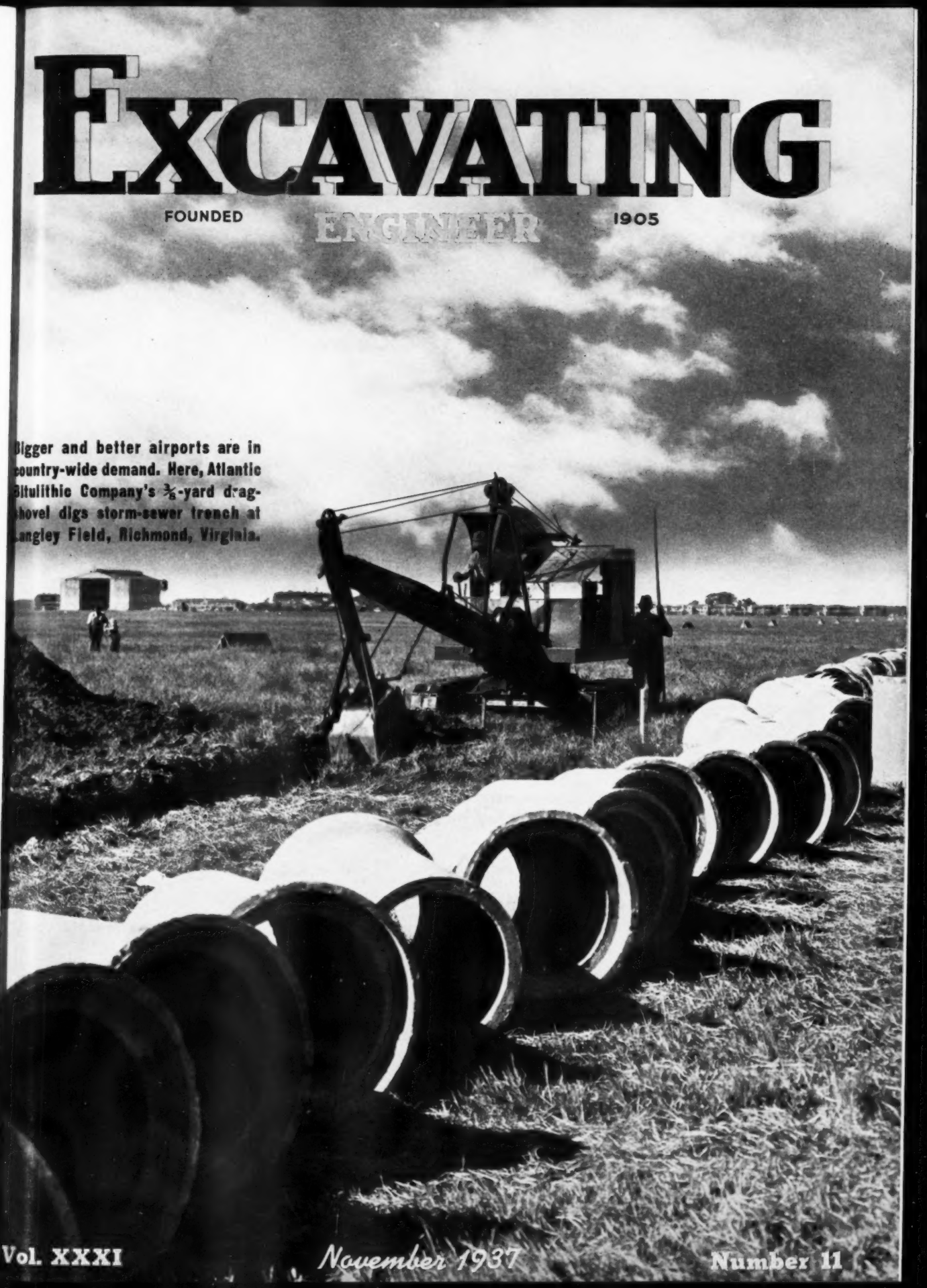
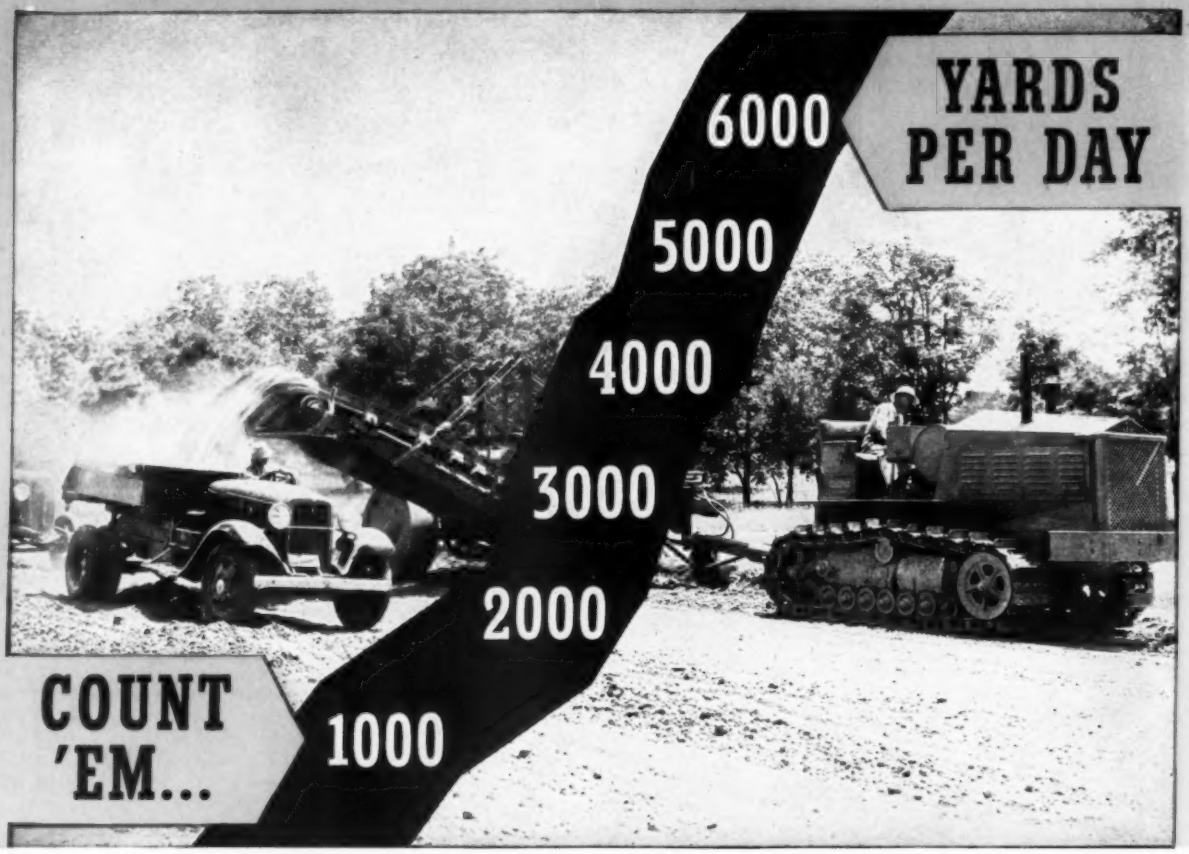
EXCAVATING ENGINEER

FOUNDED 1905



Bigger and better airports are in country-wide demand. Here, Atlantic Bitulithic Company's ⅜-yard drag-shovel digs storm-sewer trench at Langley Field, Richmond, Virginia.

Vol. XXXI November 1937 Number 11



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EXCAVATING ENGINEER

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LOOKING AHEAD

These interesting articles will appear in an early issue of EXCAVATING engineer. Watch for them.

Limestone

Herzog Lime & Stone Company uses 3-yard electric shovel in loading to small, speedy trucks which cut hauling costs.

This Will Surprises You

Wm. Williams is off again. We were afraid he'd mingle shovels and real estate in Florida, and we were right. We were surprised, however, by the appearance of the sea, serpent, believe it or not.

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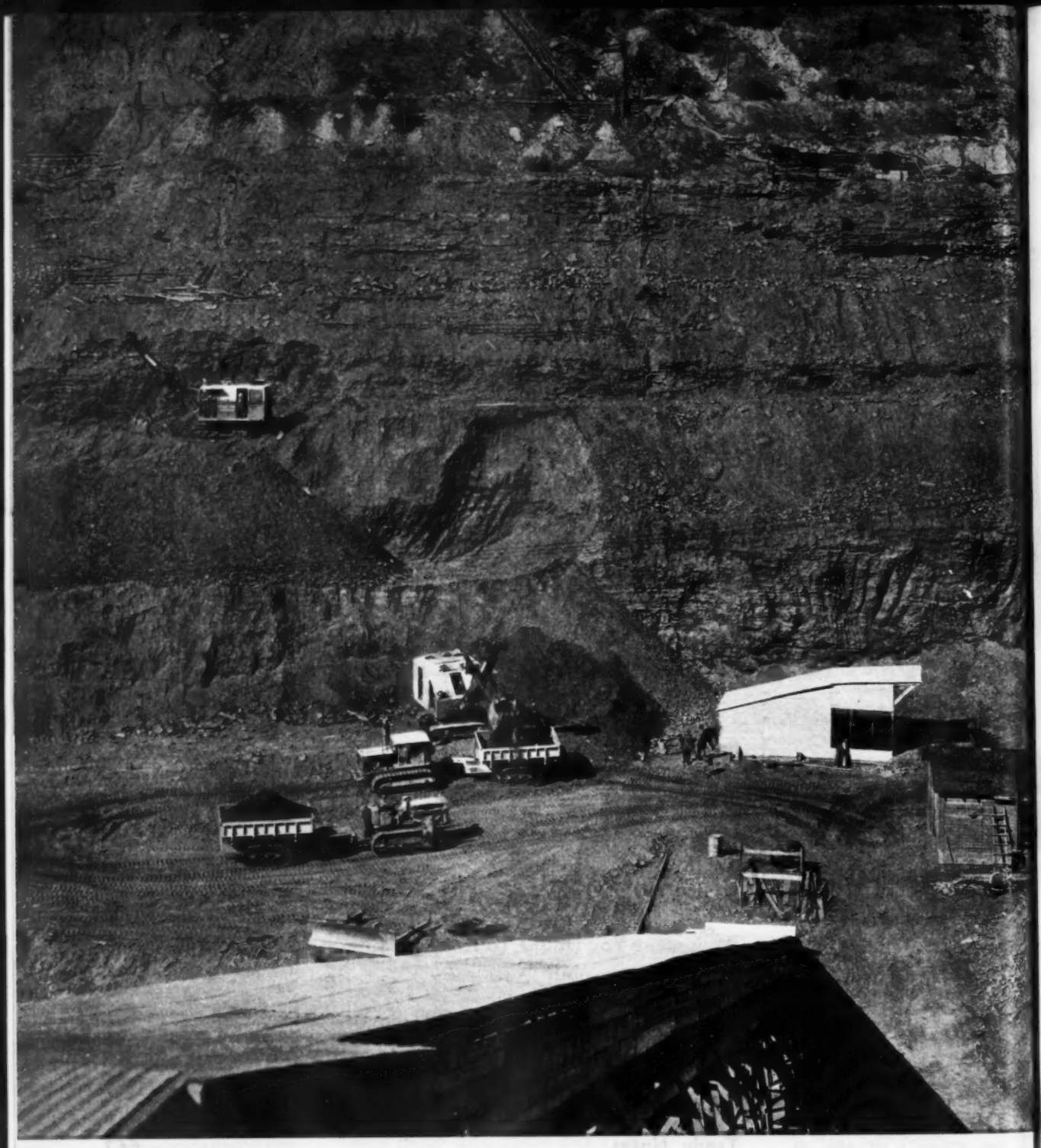

CATERPILLAR

REG. U.S. PAT. OFF

When You Need Tractors, Depend on the World's Largest Tractor Manufacturer

This International Model T-40, with bulldozer, is one of the two TracTracTors that worked on the road-building job at Rosslyn, Va., for W. H. Scott, contractor. The other TracTracTor pulled a sheepsfoot roller.

TEN industrial tractors — five wheel and five crawler types (gasoline and Diesel) — are made by International Harvester, world's largest tractor builder. This variety of types and sizes in the famous International line gives you a wide range to select from to fill your tractor needs. A long list of equipment built around these tractors further increases their usefulness.

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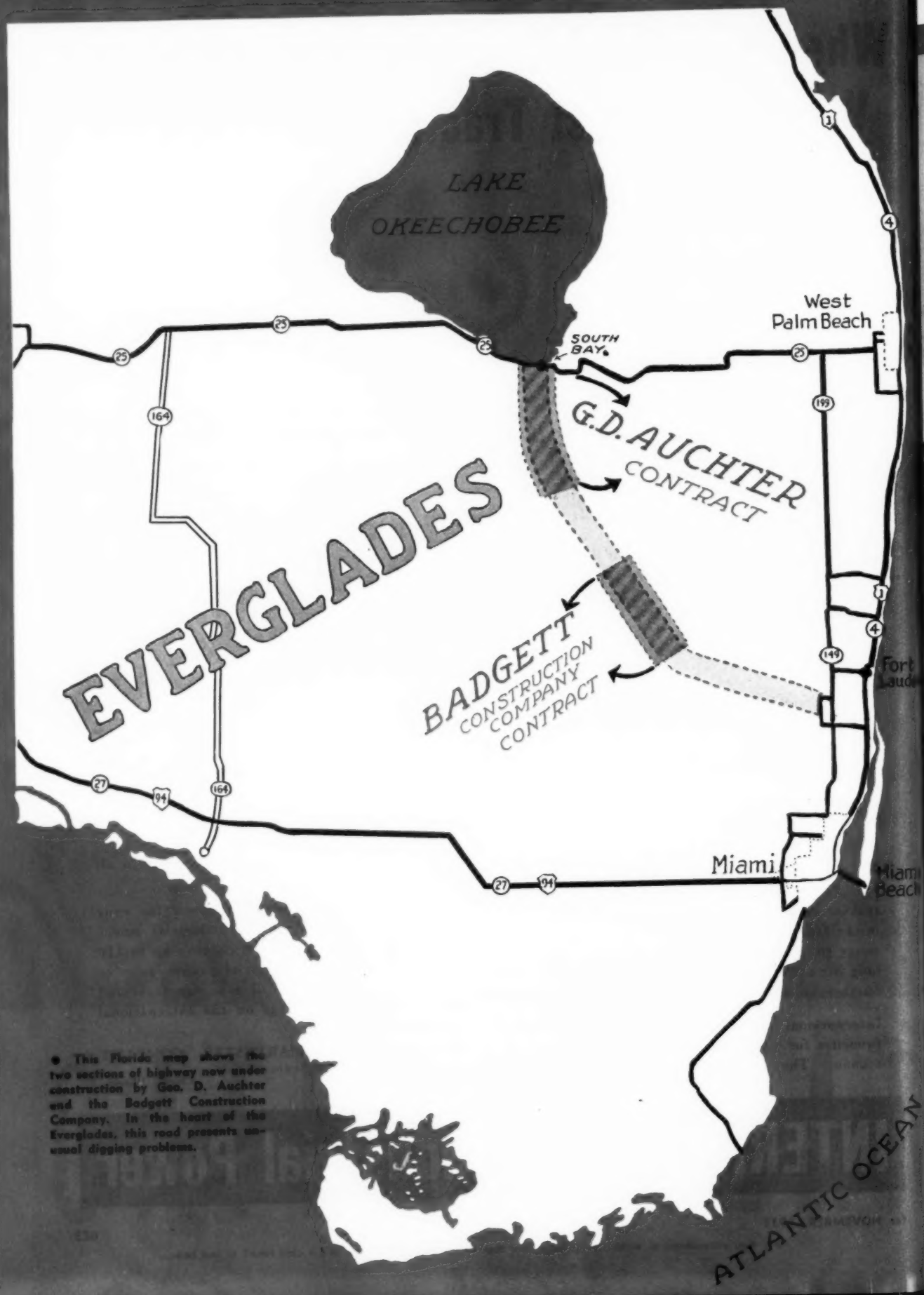


• This Florida map shows the two sections of highway now under construction by Geo. D. Auchter and the Badgett Construction Company. In the heart of the Everglades, this road presents unusual digging problems.

DRAGLINE PARADE

● The two draglines shown here are digging blasted rock from the 8-foot deep canal, swinging it to the road bed. The water hyacinths in the left foreground were one of the problems on this unusual highway job.

Geo. D. Auchter uses three draglines in successive steps of constructing new highway through water, mud, rock, and hyacinths in Florida Everglades.

By L. H. HOUCK

TIME-TRIED rules for road building have to be revised for the Federal-Aid highway job The Geo. D. Auchter Company of Jacksonville, Florida, is handling in the swampy Florida Everglades.

The $606,000 contract calls for a 20-mile rock-on-rock road which must be constructed under extremely unusual and difficult conditions. Rock for the necessary fill must be excavated from the bed of a 9-foot deep canal, the surface of which is choked with a heavy growth of water hyacinths. Supplies must be brought into the job by boat. Land equipment must operate on mats constantly because of the thick layer of soft mud surface. All in all, the difficulties presented by the job are such as to call on all the ingenuity of the Auchter forces. The success with which the problems are being met will appear in the following pages.

This new Florida road begins at the town of South Bay on the South bank of Lake Okeechobee and follows the west bank of the North New River Canal to within a few miles of Fort Lauderdale where it connects with State Road No. 26.

When completed this road will provide a picturesque route through the Everglades to Fort Lauderdale and Miami, and will be at least fifty miles shorter to these points than the existing roads.

Picturesque Problems

The road is being built through a wild section of the tropical Everglades where wild cat, deer, wild bear and turkeys still abound in fantastic numbers. Gorgeous birds make their homes in these wilds. Exotic flowers, including the wild orchid, are here. Snakes of many varieties are common and include the deadly coral, the moccasin and the dangerous rattlesnake. This area is the native habitat of the alligator.

All of this has something to do with road building and rock digging because the Everglades have come to be called the "last frontier" and many of the problems

● Clearing hyacinths from the canal so the drill barge can operate is just one of the jobs of this Bucyrus-Erie 37-B. The special bucket designed to handle these hyacinths is shown below.

encountered in combatting the obstacles of this only American tropical jungle may never be encountered again in this country. Lessons learned in the mud will come in handy because there is an abundance of mud in the Everglades—rock is rock and experienced rock men will find rock in the Everglades—but it's under eight feet of muck. And it's all under water and hyacinths. A combination that affords an interesting problem for excavation experts.

Most of the Everglades is a growth of giant saw grass and flags. It is a great marshy region covering nearly all of the lower portion of the peninsula. The southern part is a vast net work of shallow streams of fresh and wholesome water moving among countless islands of verdure.

Several canals drain a portion of the Everglades and the area south of Lake Okeechobee. Governor Broward, governor of Florida from 1905 to 1909, instituted the first drainage of this territory by using two large dredges on the east coast near where this new road comes out, to break up the limestone and coral rim that held the water back.

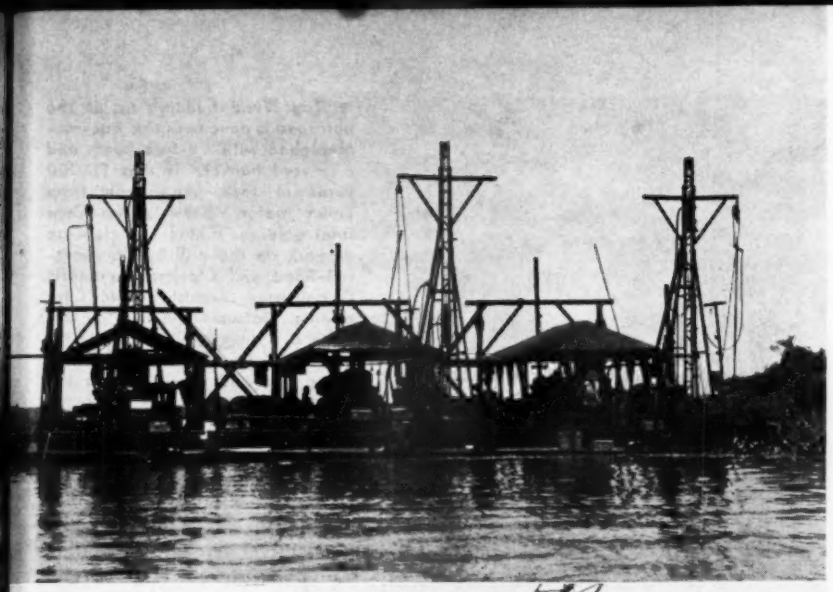
Soft Footing

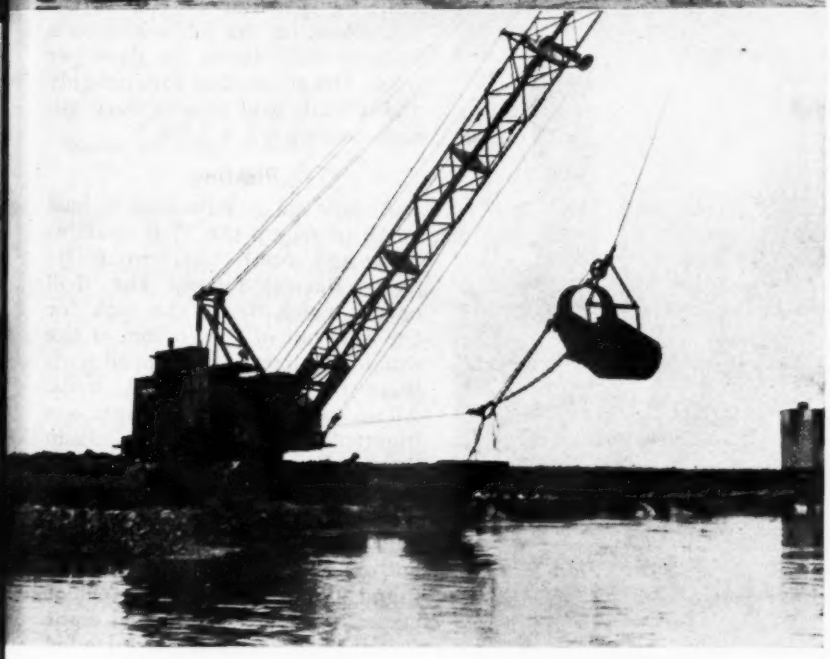
A large amount of surface water and the thick layer of soft muck has always been a difficult problem to road builders in the Florida Everglades. The Tamiami Trail from Fort Myers to Miami across the Everglades has become one of the famous roads of the country. However with modern high speed traffic the nearness of the canal to the road has proved to be a dangerous condition. The new highway of which the Auchter Company is building a part, will avoid this hazard by leaving a 60-foot space between the canal and the 30-foot-wide highway.

Other unusual features of this road include the fact that it will be the first and only highway in the Everglades to be built using the rock hardpan which underlies the muck lands as a foundation. The contract calls for construction of "rock on rock." This rock hardpan on which the road must be located has an overburden of soft black muck ranging from a foot to ten feet and the overburden is a treacherous and spongy material. Altogether the job calls for excavating 900,000 yards of muck and 1,200,000 yards of rock for the new roadway. In addition, the job includes construction of eight culverts, one every two miles and each requiring 100 yards of excavation.

The Geo. D. Auchter contract is 20 miles long and begins at a point south of the town of South Bay called Okeelanta and extends southward along the west bank of the canal. The contract ends at the county line of Palm Beach County and Broward County. Beginning at this point the $319,000 contract of the Badgett Construction Co., of Memphis, Tenn., starts. How this company is meeting the problems of its section of this road will be told in an early issue.

In setting up the best method to handle the construction problems, the Auchter forces decided on what might be called a "dragline parade." Three machines have been moved in on the job: a Bucyrus-Erie 37-B, equipped with 60-foot boom and 2-yard Red Arch bucket for straight digging,





● Following the 37-B comes the drill barge mounting three Ingersoll-Rand drills. Rock lying from 8 to 9 feet below canal surface is drilled 8 feet deep, blasted every four hours. The 2-yard dragline shown below follows the drill barge. Because of soft ground, it works on mats, one of which it is moving ahead of itself here.

and a special bucket for hyacinth work; a Bucyrus-Erie 45-B with 70-foot boom and 2-yard Page bucket; and a Bucyrus-Monighan 5-W walking dragline with 100-foot boom and 4½-yard Page and Red Arch buckets.

This dragline team works, in the order mentioned above, in the construction march from north to south ends of the job. The 37-B and 5-W, first and last units in the parade, work approximately three miles apart. Operations are on a 24-hour day, 6-day week basis. The 37-B works ahead of a drill barge and the rest of the equipment and skims the heavy growth of water hyacinths from the surface of the water.

Digging Hyacinths

To do this with the necessary degree of efficiency a special dragline bucket was fabricated on the job with widely spaced round bars for a bottom which will permit the water to escape quickly and yet hang on to some of the hyacinths.

But why so much trouble with a few "morning glories"?

Early in the 90's a beautiful plant, imported from some African stream, became a treasured flower in many homes in Florida. It was the water hyacinth and thrived so well that by the end of the decade one of the most perplexing problems of Florida transportation was the destruction of this plant which had choked the navigable rivers.

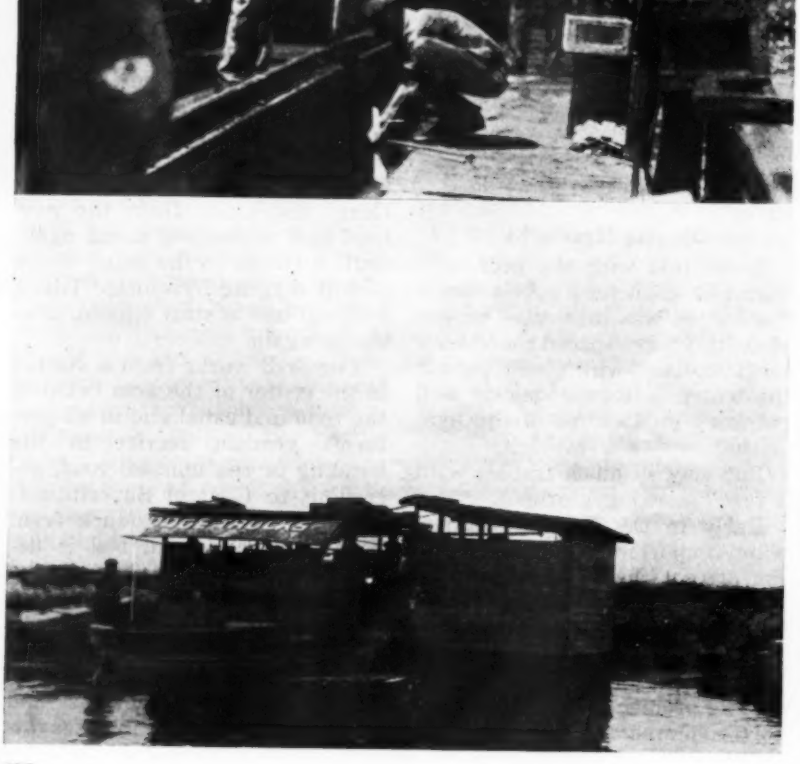
The dragline operator on the 37-B is assisted in gathering up the green springy mass of these plants by from one to two men in boats. The dragline pitches the special bucket in and tears the hyacinths from their moorings. After they are floating loose on top of the water the men in boats push the stuff into a pile on the water. The dragline then plows in and picks up as much as it can and dumps it in the area between roadbed and canal.

The surface of the water is cleared for a half mile or so before the 37-B starts any of its other work. After the clearing operation it works back, shuttle-like, excavating the muck from the bottom of the canal, the top of which it has just cleared. With the muck moved from the bottom the solid rock is clear for the drill barge which follows within a mile of the 37-B. The drill barge crew breaks up the bottom with dynamite to get the rock for the other draglines to build the fill.

When the 37-B has worked the bottom back to the point where it started moving hyacinths it then swings over to the west side and clears the muck from the new road bed, proceeding ahead again until it comes to the point where it quit digging hyacinths. That's a sign it has to start digging hyacinths again.

The 37-B works from a station in the center of the area between the road and canal and in all performs yeoman service in the building of the unusual road, according to General Superintendent F. J. Balthazor. Muck from both canal and road bed is deposited on a spoil bank along the west side of the new road, and will probably be used later to flatten slopes.

This rig averages two miles a month cleaning hyacinths and about 4000 yards daily excavat-



● Top: Final building up of the new road is done with this Bucyrus-Monighan with 70-foot boom and 4½-yard bucket. It digs 80,000 yards of rock per month from under water. Crew shown does final grading. Center: A close-up of work on the drill barge. Ingersoll-Rand and Chicago Pneumatic Compressors furnish power for drilling. Bottom: The shop on this Auchter "all-water" job is barge mounted. Outboard motor boats bring men and supplies in to the job.

ing muck. It has a caterpillar-type mounting with extra wide tracks and is powered with a Caterpillar Diesel engine. A Kohler light plant located on the rig provides light for the night shifts. All the equipment on the job works on a 24-hour daily basis, six days per week. Draglines stop for fuel only and officials said repairs were seldom necessary.

Blasting

A mile or a mile and a half north of where the 37-B shuttles back and forth performing its many duties, follows the drill barge, which blasts the rock for the road out of the bottom of the canal. The barge is equipped with three Ingersoll-Rand X71 drills. All are supplied with air from one Ingersoll-Rand and two Chicago Pneumatic compressors. Holes are drilled in a line across the canal bottom, being placed five feet apart, center to center. The rock bottom cleaned off by the 37-B is found under eight or nine feet of water. The holes are drilled eight feet into the rock and are loaded with an average of 12 sticks of powder. Shooting takes place every four hours and 20 lines are used. Dynamite used is Hercules Gelamite and DuPont Gelox. The drill barge and crew is operated on a 24-hour schedule, six days per week.

A mile north of the drill barge is the location of the Bucyrus-Erie 45-B which more or less prepares the way for the 5-W Bucyrus-Monighan which works about a thousand feet to the north of the 45-B. The bottom of the canal has been blasted when the 45-B starts in and its spends a part of its time in building road with this rock. It also makes a second rake over the roadbed to

(Continued on page 658)

County Highway Maintenance

THE gravel and secondary roads of Racine County in Wisconsin are every bit as important to the rural communities as the main paved arteries are to the urban traveler. The Racine County Highway Committee and E. R. Fischer, County Highway Commissioner are well aware of this fact. The County Highway Allotment from Gas Tax and License Fees is set up in such a manner that it can be used for both maintenance and construction. Over a period of years, the amount used for construction has probably averaged between 15 and 20%. Outside of this, most of the money raised for construction on County highways has been either by direct tax or bond issue.

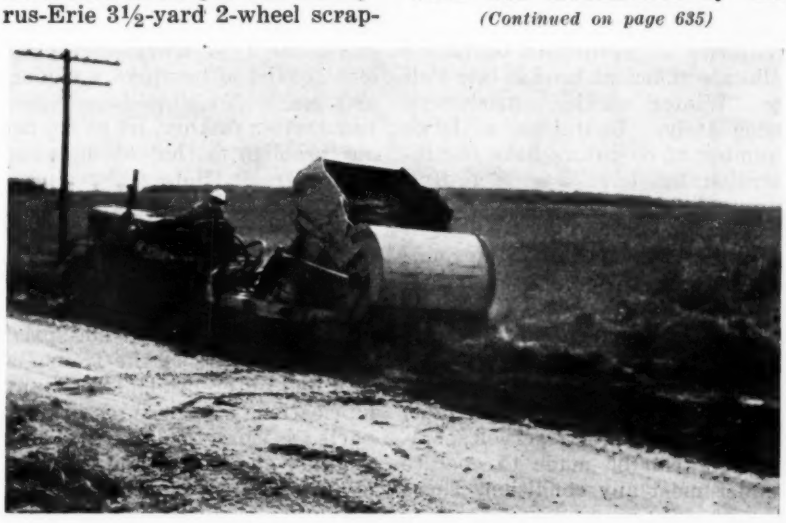
"Many of the roads taken over on our County Highway System from the Townships were very narrow, and have never had very much grading work done to them," says Commissioner Fischer. "We are trying to work out a program whereby each year some of the old narrow roads can be widened to meet the present day traffic."

Work has just recently been completed on the short 3 mile section of road bounded by county trunk K on the north and Wisconsin 20 on the south. Directly to the west a mile stretches U. S. 41, the heavily traveled main super-highway between Milwaukee and Chicago. About five miles straight east is the city of Racine, second largest city in the state.

The work done consisted largely of widening and maintenance work in building up grades from side borrow pits, lowering grades to level off sharp rises, and ditching and backsloping. The equipment used on the job was a Bucyrus-Erie 3½-yard 2-wheel scraper hauled by an International TD-40 Diesel TracTracTor and a Galion Iron Works Road Grader pulled by a Caterpillar Seventy Tractor. This equipment proved itself very efficient in service and economical to operate.

The International TracTracTor and Bucyrus-Erie scraper handled from 250-400 yards of dirt per 8-hour day depending upon the length of haul which varied from 300 to 600 feet. The Caterpillar Tractor and Gallion Grader worked up and down about a mile section of the road smoothing it and grading the gravel. Some of the toughest work was encountered by the

(Continued on page 635)



● This unit handled from 250 to 400 yards per 8-hour day, depending on the length of haul, which varied from 300 to 600 feet. Material included hard clay, unscarified gravel and tree roots.

Winter Lubrication

By C. J. COPLEY

Photo Courtesy Ford Motor Company

THERE are two months on the calendar that every automotive service manager and every equipment maintenance superintendent should mark with a large red circle. In fact, any individual owning or operating mechanical equipment should mark the warning approach of cold weather. Different sections of the country vary in the critical months that indicate climatic changes to come, but perhaps November and March are the months that should command the attention of those individuals responsible for and those individuals interested in low winter maintenance costs and uninterrupted cold weather operation of mechanical equipment.

November preparation, if we may call it that, is by far the most important time to take the needed stitch to save costly bills—bills for repairs, labor and parts that could have been avoided by the realization that cold weather lubrication demands a preparedness akin to that of bringing fur coats out of storage and filling the furnace coal bins and fuel oil tanks.

The fact that certain things must be done to prepare mechanical equipment for Winter operation is nothing new. Probably the majority of equipment operators allocate sufficient time in late Fall to "Winter service" machinery adequately. Doubtless a large number of operators have the intention, but have lacked "getting around" to the job. There are also a minority of operators willing to take the chance of allowing Summer lubricants to carry over into cold weather.

We do not intimate that machinery will fall apart in cold weather just because a Summer lubricant remains in bearings, crankcases or gear reservoirs. Machinery can be **made** to operate under most any condition. There are instances where the lighter-bodied Winter oils and greases should not be used—even, perhaps, in sub-zero weather. We do know, and we would like to devote the following pages to showing why mechanical equipment, operating under normal conditions, will pay dividends in terms of lower maintenance costs and uninterrupted operation, if the stitch in time of Winter lubrication is taken.

Since the space allotted to our discussion would not permit a detailed analysis of the individual problems of the many differing types of machinery and their varying types of service, let us confine our discussion to those essential component parts of **all** machinery requiring lubrication.

All machines and engines, when examined as a lubrication problem, consist of bearings, cylinders and gears. To simplify our subject matter further, let us confine our problem to that of the automotive truck. Here we have practically the full scope of lubricant, —application,—the forced feed and splash lubricated cylinders of the engine,—the grease and oil lubricated bearings of the wheels, engine and shackles,—the splash lubricated gears of the transmission and differential. The Winter lubrication of these component parts is practically the same whether they are found in a gasoline-driven truck, a Diesel powered shovel, or a motor-driven compressor. The reasons for precautionary cold weather lubrication are identical. Thus, aside from open gears and wire ropes, our subject can be confined to the automotive truck.

First of all, let us consider the requirements the lubricating oil or grease is called upon to meet in low temperature service. In addition to the characteristics we demand in a good Summer lubricant, namely low oil consumption and protection against metallic wear of moving parts, we add the necessity for minimum power loss due to oil drag, plus quick distribution of the oil to moving parts.

All oils react to heat or cold in a similar manner. Under high temperatures, lubricating oils will thin out; and conversely, under low temperatures, they will thicken. The degree of this thinning or thickening is dependent upon "oil quality" which we will discuss later. However, the lower the temperature, the thicker the oil. The thicker the oil, the greater is its resistance to movement and consequently, an increasing drag on bearings and gears is experienced as temperatures drop. The thickened oil will resist ready flow through the small oil passageways to bearings, and it is possible to burn out bearings because of the inability of the oil to reach freely the place where it is to work.

Since we have selected the gasoline engine powered truck as our example, let us see how this phenomenon of oil thickening in cold weather affects its operation, and point out some of the dangers surrounding the use of the wrong lubricant.

On a crisp morning when the thermometer is unexpectedly flirting with the 10°F. mark, we step on the starter expecting the customary ready purr of the motor. We are surprised and perhaps perturbed because all we get is the laboring sound of the starter and a few groans and coughs from the engine. We pull the choke. Nothing happens except we are conscious of the odor of gasoline—realize the carburetor has flooded—and sit back to wonder what has happened. We suddenly realize we have forgotten to change to winter oils and vow to have this attended to as soon as possible.

But what actually happened? Why wouldn't the engine start? The answer is that one or all of a series of things piled up logically to prevent the engine from starting.

The first offender may have been an improper fuel mixture reaching the cylinder. The slower the starter turns the engine over, the slower the fuel is drawn into the cylinder, thus setting up a condition whereby the proper mixture of air and vaporized gasoline is not obtained. Again, some types of fuels that gave good results in Summer temperature operation may not have the characteristic of readily vaporizing in cold weather conditions. The use of the choke in an attempt to get a "rich" mixture into the cylinder requires extremely sensitive manipulation, and often results in over-rich mixtures that are as difficult to ignite as lean mixtures.

Assuming our fuel was not the cause, the second offender may have been a spark insufficient to ignite the fuel. If the battery is called upon to use an unusual amount of its energy in turning over the engine under conditions of excessive "oil drag," there may not be current enough left to furnish a spark hot enough to ignite the fuel. These conditions of "battery demand" combine so that just when the greatest amount of energy in the spark is needed in order to fire the cold mixture, the starting motor tends to deprive the ignition system of that energy.

This matter of "oil drag" is the third condition tending to handicap easy engine starting. Most of the power required to crank a cold engine is expended on overcoming the resistance the oil offers to movement. As bearings turn in thick viscous films of oil—as gears dig into their reservoirs of cold-thickened lubricants, motion is resisted and we call it "oil drag." As oils are chilled, this "drag" increases. It is quite probable that this degree of thickening could reach a point where the battery is

● **This diagram shows lubrication for a Bucyrus-Erie ⅜-yard shovel.**

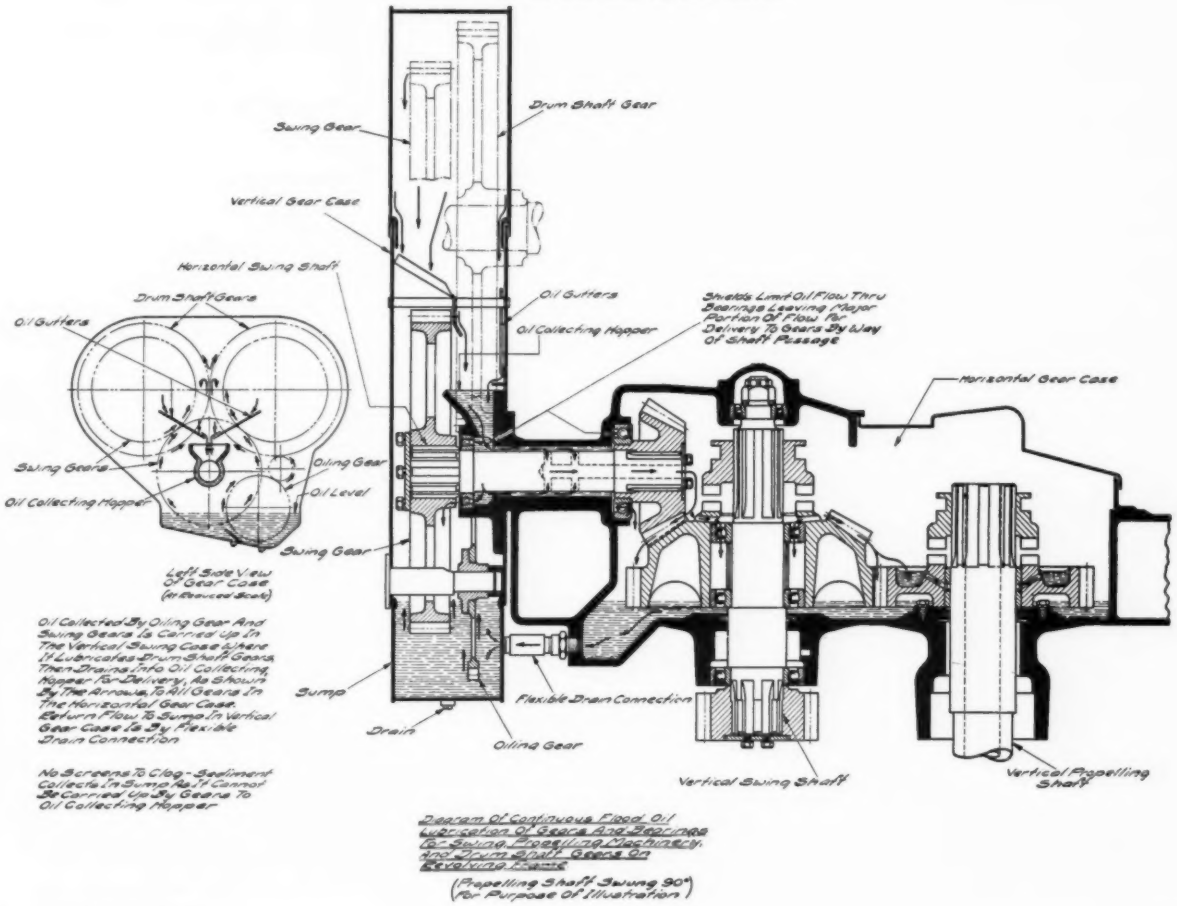

Swing Gear
Drum Shaft Gear
Vertical Gear Case
Horizontal Swing Shaft
Drum Shaft Gears
Oil Gutters
Oil Collecting Hopper
Shields Limit Oil Flow Thru Bearings Leaving Major Portion Of Flow For Delivery To Gears By Way Of Shaft Passage
Horizontal Gear Case
Swing Gears
Oiling Gear
Oil Level
Swing Gear
Left Side View Of Gear Case (Ill Revised Scale)
Oil Collected By Oiling Gear And Swing Gears Is Carried Up In The Vertical Swing Case Where It Lubricates Drum Shaft Gears, Then Drains Into Oil Collecting Hopper For Delivery, As Shown By The Arrows, To All Gears In The Horizontal Gear Case. Return Flow To Sump In Vertical Gear Case Is By Flexible Drain Connection
No Screens To Clog - Sediment Collects In Sump As It Cannot Be Carried Up By Gears To Oil Collecting Hopper
Sump
Drain
Flexible Drain Connection
Oiling Gear
Vertical Swing Shaft
Vertical Propelling Shaft

Diagram of Continuous Flood Oil Lubrication Of Gears And Bearings For Swing, Propelling Machinery And Drum Shaft Gears On Revolving Frame

(Propelling Shaft Swung 90° For Purpose Of Illustration)

EACH 1000 MILES
A PRESSURE GUN LUBRICANT
C ENGINE OIL (DISTRIBUTOR SHAFT, GENERATOR, FAN, BRAKE CLEVIS PINS AND ACCELERATOR.)
D ADD GEAR OIL TO LEVEL OF FILLER PLUG: WINTER S.A.E. VISCOSITY 90 OR 110 SUMMER S.A.E. VISCOSITY 160
E ADD EXTREME PRESSURE GEAR OIL TO LEVEL OF FILLER PLUG: WINTER S.A.E. VISCOSITY 90 OR 110 SUMMER S.A.E. VISCOSITY 160.
F EVERY 2000 MILES DRAIN AND REFILL WITH ENGINE OIL ABOVE 90 F. S.A.E. 50, 100 F. TO 30 F. S.A.E. 40, 65 F. TO 20 F. S.A.E. 30, 50 F. TO 0 F. S.A.E. 20 OR 20 W. 30 F. TO -15 F. S.A.E. 10 OR 10 W. BELOW -10 F. TO W. PLUS 10 KEROSENE.
G DRAIN SEDIMENT
H ADD DISTILLED WATER
J UNIVERSAL JOINT GREASE (CYLINDER OIL SODA SOAP GREASE).
L SPRAY SPRINGS (PENETRATING OIL)
N LUBRICANT IMPREGNATED WAX ON HOOD LACINGS, DOOR STRIKER PLATES AND DOVETAILS.
O PENETRATING DRIPLESS TYPE LUBRICANT FOR DOOR HINGES
P WASH SCREEN IN GASOLINE—WET WITH ENGINE OIL WHEN DRY
CARBURETOR SILENCER AND AIR CLEANER
FRONT WHEEL
SPINDLE PIN
FRONT BRAKE SHAFT
FRONT SPRING
DISTRIBUTOR
GENERATOR
TIE ROD
CLUTCH RELEASE SHAFT
BATTERY
ENGINE
Y TRANSMISSION (CAPACITY 5 PINTS).
UNIVERSAL JOINT (FRONT)
UNIVERSAL JOINT (REAR)
SPRING SHACKLE
DRIVE SHAFT
REAR SPRING
REAR WHEEL BEARINGS
SPRING SHACKLE
REAR BRAKE SHAFT
REAR AXLE (CAPACITY 7 PINTS).
REAR BRAKE SHAFT
SPRING SHACKLE
SPRING SEAT
REAR WHEEL BEARINGS
CLUTCH RELEASE SHAFT
CLUTCH PEDAL
BRAKE PEDAL
DRAG LINK
STEERING GEAR
FUEL PUMP
FRONT WHEEL
FRONT BRAKE SHAFT
DRAG LINK
SPINDLE PIN
TIE ROD
SPRING SHACKLE
REAR SPRING
EACH FALL AND SPRING
OR EVERY 5000 MILES (WHICHEVER OCCURS FIRST)
Z PACK WITH FORD WHEEL BEARING GREASE M-544 IF REQUIRED.
Y DRAIN, FLUSH AND REFILL WITH GEAR OIL WINTER S.A.E. VISCOSITY 90 OR 110 SUMMER S.A.E. VISCOSITY 160.
W REMOVE AND CLEAN SCREEN
U DRAIN, FLUSH AND REFILL WITH EXTREME PRESSURE GEAR OIL WINTER S.A.E. VISCOSITY 90 OR 110 SUMMER S.A.E. VISCOSITY 160.
S FORD DISTRIBUTOR GREASE M-4501 SPARINGLY ON CAM LOBES.

● Lubrication system for Ford truck. Diagram courtesy Ford Motor Company.

unable to overcome the load imposed.

The source of energy that is required to supply the hot spark to enable ignition and at the same time overcome oil drag in turning the engine over, comes from the battery. Here again we find conditions working to make the starting problem increasingly difficult as temperatures drop.

Low temperatures tend to slow down the chemical action which creates the electric current in a battery. To illustrate the falling off of battery efficiency in cold weather and the accompanying increasing demands on the battery in cold weather, we show in Fig. No. 1* statistics compiled by one of the leading motor car builders.

This chart being self-explanatory, we can readily see why the starter labors under our cold start at 10°F when we "forgot" to change to a proper Winter lubricant. We see that with an SAE 30 oil in the crankcase at 10°F, our battery can deliver only 69 foot pounds of usable energy, whereas we require 108 foot pounds to turn the engine over, let alone supplying the additional current necessary for the "hot" spark of ignition.

While delayed starting does not necessarily result in any particular damage by itself, it does bring us to the consideration of a phase of difficult starting that does cost money. Once our engine has "caught," we are naturally anxious that it does not stop and consequently the tendency is to "race" the engine to warm it up quickly. This "racing" of a cold engine results in more wear taking place in the first thirty seconds than probably takes place in the next 24 hours of driving. Our difficulty in starting was caused in part by cold oil refusing to move readily with the revolving parts. By the same token, the oil refuses to flow through the small oil passageways with the result that an inadequate supply of oil reaches the bearings in the initial starting period. Thus there may be set up a condition of starved bearings and cylinders, resulting in a high rate of wear.

Hence, ready distribution of the oil in cold weather—an ability to flow quickly and easily—is a characteristic demanded in a cold weather lubricant.

It would seem from the foregoing that for engine lubrication in Winter, the lightest oil available should be used to assure minimum "oil drag" and the maximum of ready distribution. While these two characteristics are important, a third requirement must be met by the Winter lubricant, namely the ability to protect the moving parts against wear. After getting our engine started and being assured that a proper supply of oil is reaching the places it should, the oil must maintain a film between piston ring and cylinder wall—between the revolving shaft and its bearing housing. After the engine "warms up," crankcase temperatures increase and, as temperatures increase, the oil tends to lose body. This loss in

Temp.	Torque Required (in ft. lbs.)		Torque Available (in ft. lbs.) from cold battery
	10W Oil	SAE 30	
60°F	10	25	82
50°F	13	28	80
40°F	15	31	78
30°F	20	38	76
20°F	25	60	73
10°F	32	108	69
0°F	45	208	62

Fig. No. 1

*General Motors "The Trend is Toward Lighter Oils."

body must not reach a degree whereby proper oil films cannot be maintained. The oil must be able to maintain its sealing film in the cylinder to resist loss of power caused by blow-by—a duty it performs under the high heats of combustion. Thus it can be seen that our winter oil must not only be thin enough to afford easy starting and ready distribution, but it must also be thick enough to maintain its body under the high temperatures of continued operation. Particularly is this latter characteristic a necessity when we consider the in-between-season operation where temperatures vary widely from morning to night and from day to day.

So much for our engine with its cylinders and bearings. While the gears of transmissions and differentials make their own particular demands on the Winter lubricant, we have in the main the same requirements.

In the case of gear lubrication, the oil must not be so heavy as to impede the free action of the gear wheel. The oil must not thicken to a point where the gear wheel will dig a groove in the lubricant —an action known as "channeling." The oil must not only be fluid enough to coat and follow the gear teeth, but it must also maintain sufficient fluidity to reach readily the bearings of the gear wheel. While loads remain the same in Winter and in Summer, we are forced to use lighter-bodied gear oils. If improperly made, these lighter oils are unable to protect gear teeth adequately against the high tooth loadings.

We have tried to show the importance of removing Summer lubricants and replacing them with properly designed lubricants for Winter service. While little or nothing has been said about greases, the same practical reasoning applies relative to their use. Winter greases are usually of a semi-fluid nature, of low soap content, which permits their easy application through grease fittings in cold weather. Thick Summer greases, with their high soap content, tend to form into hard, compact masses in cold weather. Their lubricating value decreases in proportion to lowering temperatures. They do not give up their oil content until the bearing, heating because of the lack of lubrication, develops a temperature sufficient to melt the grease. When this stage has been reached in the bearing and lubrication does take place, the damage has been done and the bearing surfaces are materially worn.

So much for the requirements of the Winter lubricant. We cannot pass by the matter of Winter oils without commenting on the question of their selection. Nearly all machinery manufacturers, for the lack of a better scale, advise the selection of lubricants by S.A.E. Numbers. Briefly, we cannot emphasize too strongly the dangers evolving around the use of this numbering system alone as the basis for Winter oil selection. One or two typical examples of the policies underlying this system should be sufficient to impress the intelligent operator with their possible danger.

Refer again to the chart depicting battery efficiency. Note the relative work required to turn the engine over at 0°F when using a 10W oil as against the S.A.E. 30 oil.

These figures of 45 and 208 ft. lbs. are based upon properly made lubricating oils. It is perfectly possible and not at all improbable that there are cheaply made 10W oils that will and are being marketed this Winter that, at 0°F., are 1½ times as heavy as a well-made S.A.E. 30 oil. It is possible to be misled by the figures "S.A.E. 20" marked on a can of oil which, in reality, contains a product that is 6 times as heavy as the lightest S.A.E. 30 oil obtainable at 0°F. Hence it can be seen that the S.A.E. markings on the barrel or can of oil are misleading to those who do not fully understand the intended use and proper interpretation of the S.A.E. Numbering System.

One more point should be clearly stated relative to Winter lubrication, and that pertains to the matter of drainage periods of crankcase oils. In cold weather operation, the wise operator will drain and replace crankcase oils every 500 miles of operation. Cold engine starts, frequent use of the choke and slowly vaporizing fuels tend to dilute the oil in the crankcase. The unburned fuel from the combustion chamber will drip past the piston rings down into the crankcase and our light-bodied Winter lubricant eventually will become contaminated with gasoline to a point where its body may be reduced below the proper point of safety. The recommended change of 500 miles is not made because the oil "wears out," but because of the possibility of dangerous dilution that may take place in that interval.

● Six-wheelers see tough service on this Geo. M. Brewster job. Photo courtesy Mack Trucks, Inc.

EXCAVATING ENGINEER

FOUNDED 1903

A Monthly Publication
Devoted to the Excavating Industry

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Saving Time

On most excavating jobs the old saying, "a minute saved is a dollar earned" is no exaggeration. Any time which can be saved on the job shows up in increased output or reduced costs. Both mean an increased profit for the contractor.

One good bet—missed on many jobs—for saving money, is laying out the job in such a way that shovel swing time is cut to the minimum. Ordinarily, swinging takes 60 per cent of the time required for each digging cycle. Therefore, anything that can be done to cut swinging time results in moving more dirt in the same period of time. A little figuring will show the importance of even a small reduction in swing time.

Suppose you are getting three digging cycles a minute with a ½-yard shovel. If your bucket efficiency is 85 per cent, you will be loading 1.275 yards of dirt per minute, or 74.5 yards per hour. Time used solely for swinging would be 36 minutes per hour. Save 10 per cent of this time, or 3.6 minutes, and you increase your output to 79.09 yards per hour.

How can swing time be brought down to a minimum? We recently saw a job where a ⅜-yard shovel was loading easy dirt from a roadside bank to trucks. The swing on this job was varying from 90 to 135 degrees. It would have been perfectly simple to spot the trucks so a regular swing of 45 degrees could be obtained. Obviously, elimination of the unnecessary swing would have increased output on this job.

For many years Excavating Engineer has advocated the use of double-spotting wherever practical. On a small shovel job, the time required for a full truck to move out and an empty to move in means a loss of several yards. If that empty was spotted on the other side of the shovel, there would be no break in loading. Output would be considerably increased at no increase in cost.

On quarry jobs, and others where output is governed by orders, the value of cutting swing time to a minimum lies in reducing costs. For example, swinging takes power; reduce swing time and you cut power consumption and costs. And a very small saving mounts up over a period of time. It is possible also that enough saving on swing time could be made so that the desired output could be maintained by fewer hauling units, with a considerable resultant saving.

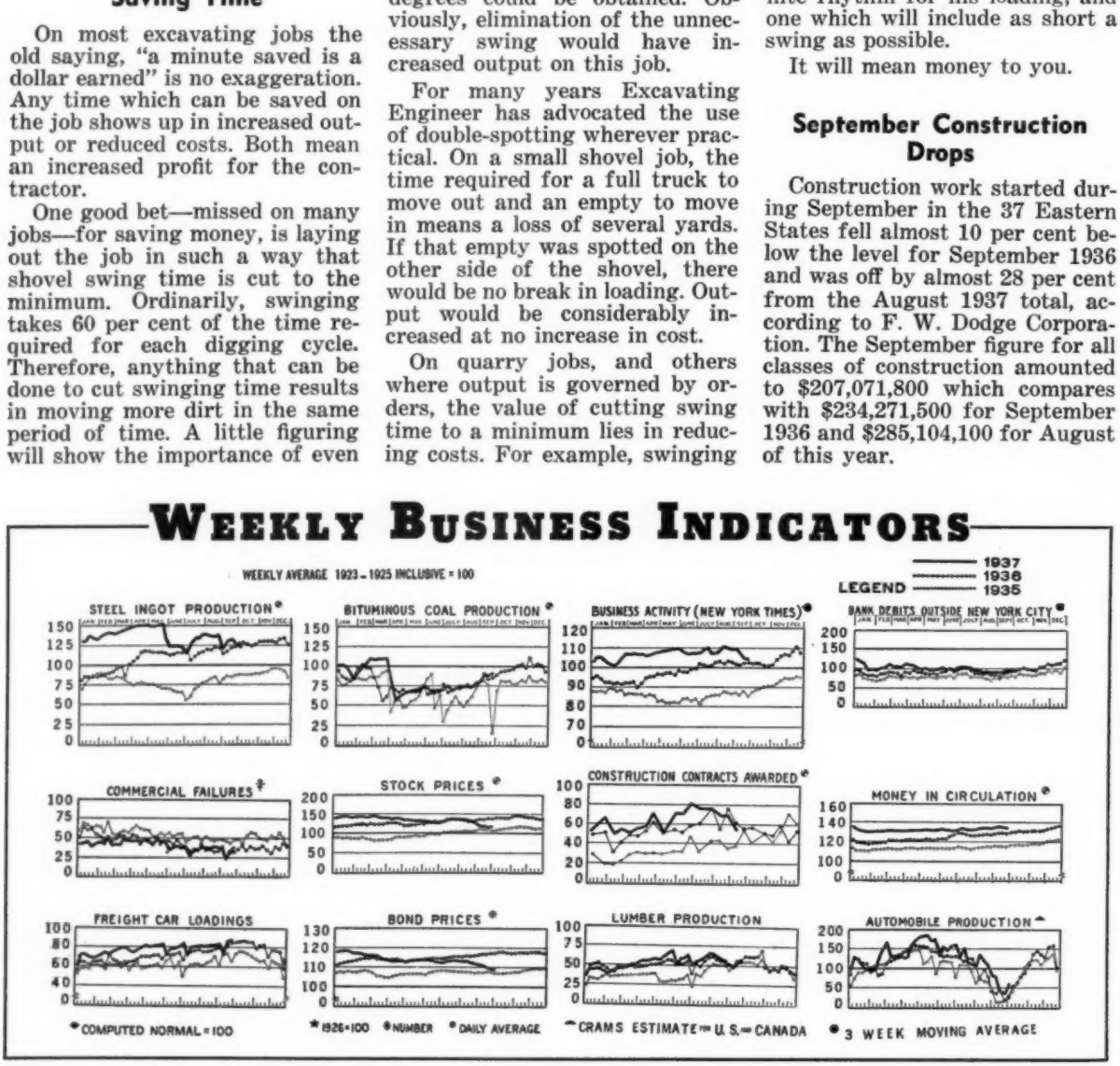
Added output or reduced costs may not be possible on every job. The important point for every digging executive to realize is that a reduction in one thing—swing time on your shovel—may easily be worth real money. Therefore you should make every effort to study your job carefully and lay it out for minimum swinging. Plan the job so your shovel operator can set up a definite rhythm for his loading, and one which will include as short a swing as possible.

It will mean money to you.

September Construction Drops

Construction work started during September in the 37 Eastern States fell almost 10 per cent below the level for September 1936 and was off by almost 28 per cent from the August 1937 total, according to F. W. Dodge Corporation. The September figure for all classes of construction amounted to $207,071,800 which compares with $234,271,500 for September 1936 and $285,104,100 for August of this year.

Weekly Business Indicators



Of the current September total $65,589,800 went into residential building; in September last year this class recorded a volume of $80,670,800 while in August of this year residential building amounted to $73,448,300. Excepting only the Upstate New York, Middle Atlantic, the Southeastern, and the New Orleans territories declines from a year ago in residential building were general.

Non-residentail building operations in September amounted to $75,660,000 which compares with $69,098,700 for September 1936 and $117,209,800 for August, 1937. Public works and utilities construction started in the 37 Eastern States in September amounted to $65,822,000 as contrasted with $84,502,000 for September of last year and $94,446,000 for August of this year.

For the first nine months of 1937 the total volume of construction work undertaken in the 37 Eastern States amounted to $2,307,014,300; this was an increase of 13 per cent over the total of $2,041,628,200 shown for the corresponding nine months of 1936.

The residential building total for the initial nine months of the current year amounted to $736,390,600 for a gain of 25 per cent over the total of $588,031,600 reported for the corresponding nine months of last year. Non-residential building volume recorded thus far in 1937 amounted to $894,894,900 against $735,337,100 for the like 1936 period. Public works and utilities construction thus far in 1937 totaled $675,728,800 as compared with $718,259,500 for the nine-month period of 1936.

End of the Trail

What happens to old shovels when their period of service is over is shown in the accompanying picture. This particular rig was a 65-ton Bucyrus steamer. Equipped with a two-yard rock dipper, 18-foot six-inch dipper sticks, and 28-foot boom, the shovel was shipped to the Mahoning Ore & Steel Company on August 14, 1906. After many years of loading out iron ore at this mine near Hibbing (now operated by Pickands Mather & Company), the veteran was scrapped.

Ties saturated with oil were piled around the machine and set afire. Everything inflammable

was burned off the machine, and even the babbitt melted out of the bearings. After this, the machine is cut up for scrap. The photograph shows the shovel after burning, and just before cutting up.

It is interesting to note that a new electric loading shovel, a Bucyrus-Erie 170-B with 6-yard dipper, is now going into service in the same pit. Should we say—"The King is dead, long live the King"?

Social Security Records

A recent letter from one of our readers who employs a small number of men intermittently in quarry work, brings up a question concerning Social Security duties which may be of general interest. Question, and our attorney's answer are given herewith.

Q. I have filled out Social Security Form SS-1 every month since January of this year, and have sent it in to the U. S. Collector of Internal Revenue with 1% withheld from the pay of all my men, and an extra 1% out of my pocket. Now, at this late date, the Collector sends me Forms SS-2 and SS-2a, and wants me to go back to dig through my records and tell them in detail just which employes I collected how much from. Do I have to do this? They have the money; why should they care where it came from? If they mistrust me, they can come and audit my books; but why should I do their accounting for them?

A. The Social Security Act has been held constitutional by the Supreme Court of the United States. Sec. 807 (c) of the Act makes applicable certain provisions of the Revenue Act of 1926, one of which reads:

> "Every person liable to any tax imposed by this Act, or for the collection thereof, shall keep such records, render under oath such statements, make such returns, and comply with such rules and regulations, as the Commissioner, with the approval of the Secretary, may from time to time prescribe."

Another provision of the Revenue Act imposes of a maximum penalty of $10,000 fine and one year's imprisonment, for failure to file a return.

As to the reasonableness of the requirements, you acted as a tax-collector for the Federal Government when you deducted this 1% from the wages of your employes. You would not consider your city tax-collector justified in refusing to report the names of the persons from whom he collected the taxes. Furthermore your employes will not be able to draw their pensions on reaching the age of 65, unless the Government has record of the wages which they have been paid since January 1, 1937.

County Highway Maintenance

(*Continued from page 629*)

scraper unit which had to cut through hard packed clay, tree roots, and some unscarified gravel to dig the ditch and widen the road.

Work has now been completed and the equipment has been hauled to a different location for additional maintenance work on other connecting and side roads. This constant maintenance and improvement program keeps the roads in shape and calls for no large cash outlay for entire reconstruction as would be the case were the road neglected for several years.

"What did you do in the circus?"

"Well, you know the elephants—"

"Oh, so you trained them?"

"Gosh, no! If I'd been able to train them I wouldn't have had to do so much sweeping out!"

NOT in the Contract

Tramp: "Could you give a poor fellow a bite?"

Lady: "I don't bite, myself, but I'll be glad to call my dog."

"Here comes the parade. Where's Aunty?"

"She's upstairs, waving her hair."

"Goodness, can't we afford a flag?"

The boss asked one of the stenographers in the office, "What would you say if I hired you as my private secretary?"

And the coy little stenographer replied, "I wouldn't say anything but 'Yes'."

"Do you know what good clean fun is?"

"No, what good is it?"

"Young man, have you been making advances to my daughter?"

"Yes, sir, and—I wasn't going to mention it, but I wonder if you could get her to pay me back?"

Girl—Sure, I'll go riding with you, but when we come to a railroad crossing, will you be sure and stop?

Operator — Absolutely! Until we get across the tracks, I'll drive with both hands.

"Halloo, Bridget. What time is it, and where's the apple pie?"

"It's eight sir."

Thrifty Host: "And when will you dine with us again?"

Guest (still hungry): "Now, if you like."

"How did you stop your husband from staying late at the club?"

"When he came in late one night, I called out, 'is that you, Jack?'"

"Well?"

"My husband's name is Robert."

"Oh, yes, lady, my family have been seafarers for generations."

"Followed the sea, eh?"

"No, they sold shore dinners."

He: "I'm a bank examiner."

She: "Well; I'm no bank."

Wife: "I want you to match this piece of silk for me before you come home tonight."

Husband: "At the counter where the sweet little blond works? The one with the soft eyes and—"

Wife: "No, dear, I'm afraid you're much too tired to shop for me after having worked hard all day. On second thought, I'll not bother you with it."

Entering a tavern with his wife and six-year-old son, Oscar ordered two straight whiskies.

"Hey, Pa," the boy said, "ain't Ma drinkin'?"

"When a girl wears a silk stocking, the men like to make a fuss over it—just a little over it."

"Little boy, why aren't you in school?"

"Hell, lady, I ain't four years old yet."

A Scotchman consulted his doctor, and was told he must give up drinking. Disgusted, the patient started for the door, was stopped by the doctor.

"The fee for my advice," said the doctor, "is $10.00."

"That's all right," replied the Scotchman, "I'm no' takin' your advice."

BRUTES!

Make Tough Jobs Easy—Make Pay Loads Pay!

IT TAKES a *he*-tire to do a dump truck's work. Even then—the toughest, sturdiest kind of tire must be suited to the job it's got to face if it's going to perform efficiently and economically.

That's why Goodyear offers you a choice of three great dump truck tires. They're big, tough, husky brutes—each one built to do a particular type of dump truck work better and longer than any other tire made—to make the toughest job easier—to dig in, pull through and hold up under the worst possible service without holding up your trucks or men. They save you time and money.

There's the All-Weather Dump Truck Tire (1) for all-around dump truck work; the Pneumatic Lug Tire (2) for trucks that plow through gouging, cutting, tread-ripping rocks and sharp stones; and the Goodyear Sure-Grip (3) that digs in without slipping in the worst kind of sloppy, soft or sandy going.

The difference in these tires is in the tread—each fitted to a different type of going. Underneath is the sturdiest, longest-lasting construction it is possible to build into a tire: Patented, pre-shrunk Supertwist Cord—blowout protection *in every ply;* specially-processed, chemically-toughened rubber in both tread and body; braided wire beads.

Look into these tires without delay. Have the Goodyear dealer nearest you show you all three—help you select the right one for your work.

THE GOODYEAR TIRE & RUBBER COMPANY, INC., AKRON, OHIO

CUT OPERATING COSTS STILL MORE WITH GOODYEAR BATTERIES, RIMS, FAN BELTS, RADIATOR HOSE

For your convenience in writing to The Goodyear Tire & Rubber Company, Inc., you will find a card bound in this issue.

Equipment you ought to KNOW ABOUT

DA-30 Drifter

Ingersoll-Rand Company, 11 Broadway, New York, New York, has recently introduced a new drifter drill called the DA-30. It is in the 125 pound class, and is used for mining operations such as small drifts, tunnels and stopes.

A new double-opening valve has, it is claimed, increased the

The DA-30 with Auto-feed and Jackbits

drilling speed without increasing the air consumption. The auto feed feature releases the drill runner from hand cranking, feeding being automatic in any position without air or other power.

Delmag Tamper

An explosion type Tamper weighing 220 lbs. has been announced by The Calhoun Company of 1151 South Broadway, Los Angeles. Superior compaction, ease of operation and economy are features claimed of this machine. Quickly changed bases convert it from a Tamper to a Hammer for

driving piles and sheeting. Other bases are available which adapt the machine to concrete breaking, concrete tamping, also tamping of gravel roadways and cobble stones.

It may be controlled with one hand only and operates on either benzol or aviation gasoline. Ignition is by a 6 volt motorcycle battery carried upon the operator's back and controlled by a push button located on one of the handles. It hops approximately 18" vertically and is guided by simply inclining the machine in any direction desired.

New Atlas Conveyor

Lightweight, sturdy construction, and low operating costs are the principal features claimed of the new Model B-18 Atlas Conveyor, which has just been announced by the Atlas Conveyor Company, Clintonville, Wisconsin.

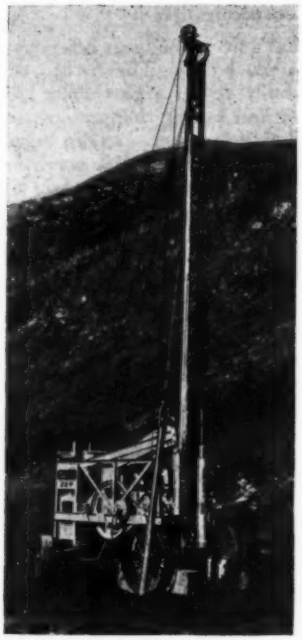
The Atlas engineering staff designed the Model B-18 to handle

a variety of tasks: moving sand, gravel, stone, etc. Its lightweight construction permits its being moved easily from one job to another, with a minimum of time and expense.

New Prospecting Drill

Recently added to the Bucyrus-Armstrong line of prospecting drills is the compact, modern, all-welded, all-steel, light weight, easily transported 23-P Placer-Prospecting Drill.

Built especially for placer test-hole work, the 23-P, it is claimed, provides exceptional accuracy in the obtaining of samples of gold and other minerals. Pipe driving and pipe pulling, the two most important phases of placer test-hole drilling, are provided for with a special spudding beam having two positions for the pitman connection. One position gives the machine a very rapid down-stroke for effective pipe driving; the other position produces a powerful up-stroke for pipe pulling. Although a comparatively light machine, the new drill swings a heavy string of tools that permits high-speed drilling. Other features include geared hoist and worm feed on the bull reel, all-steel derrick with 8-point pipe bracing, rubber shock-absorber for effective use



of steel line, and wheel or truck mounting. Full details may be obtained by writing to Bucyrus-Erie Company, South Milwaukee, Wisconsin.

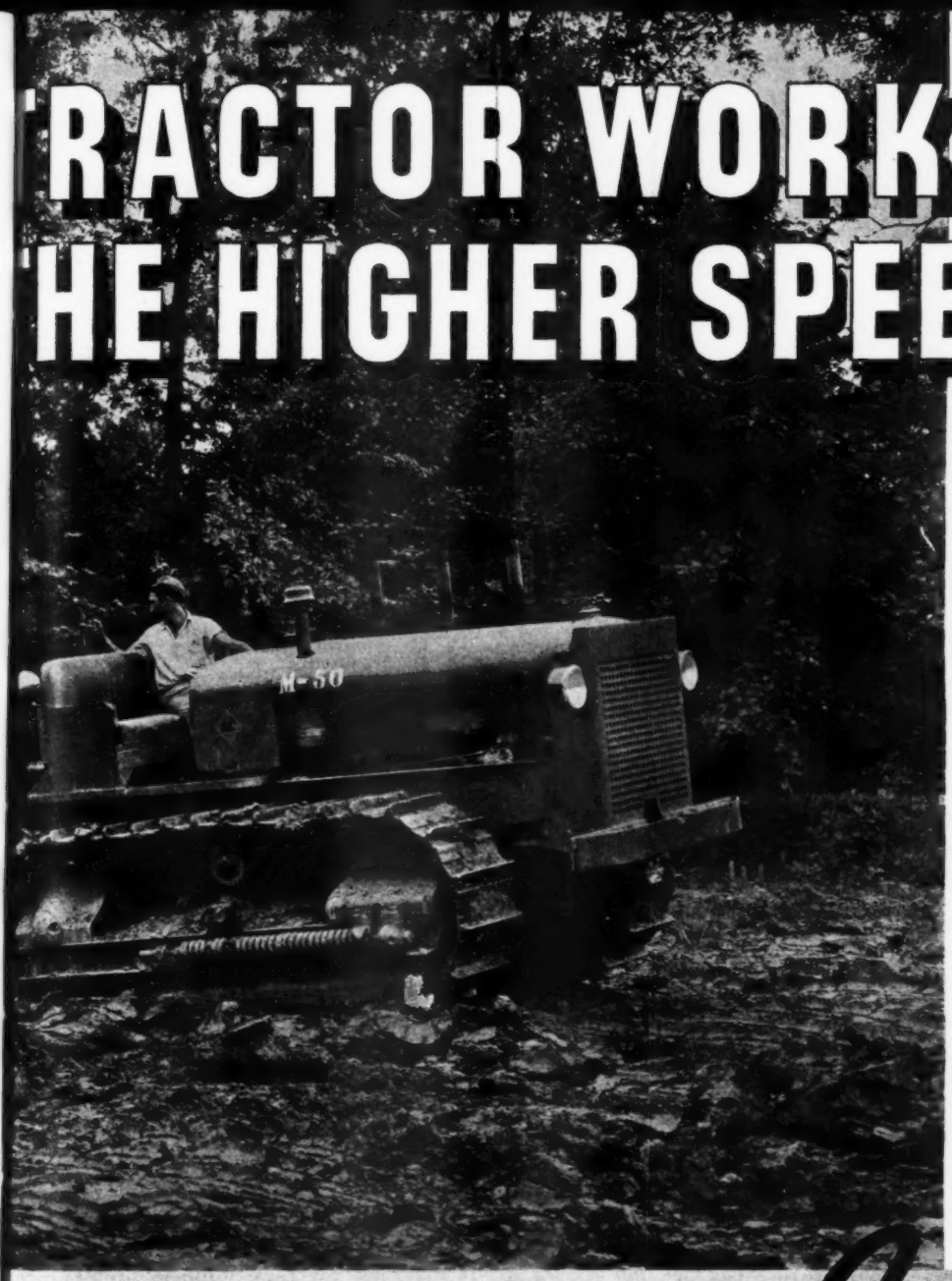
Asphalt Mixer

Recently the Iowa Manufacturing Company of Cedar Rapids, Iowa, delivered a Traveling Road Mix Plant on which a Model 6-LD-909 Buda Diesel Engine furnishes the power.

This plant has 1,000 gallon supply tank, equipped with kerosene pressure burners for maintaining

(Continued on page 642)

'RACTOR WORK IS 'HE HIGHER SPEEDS...

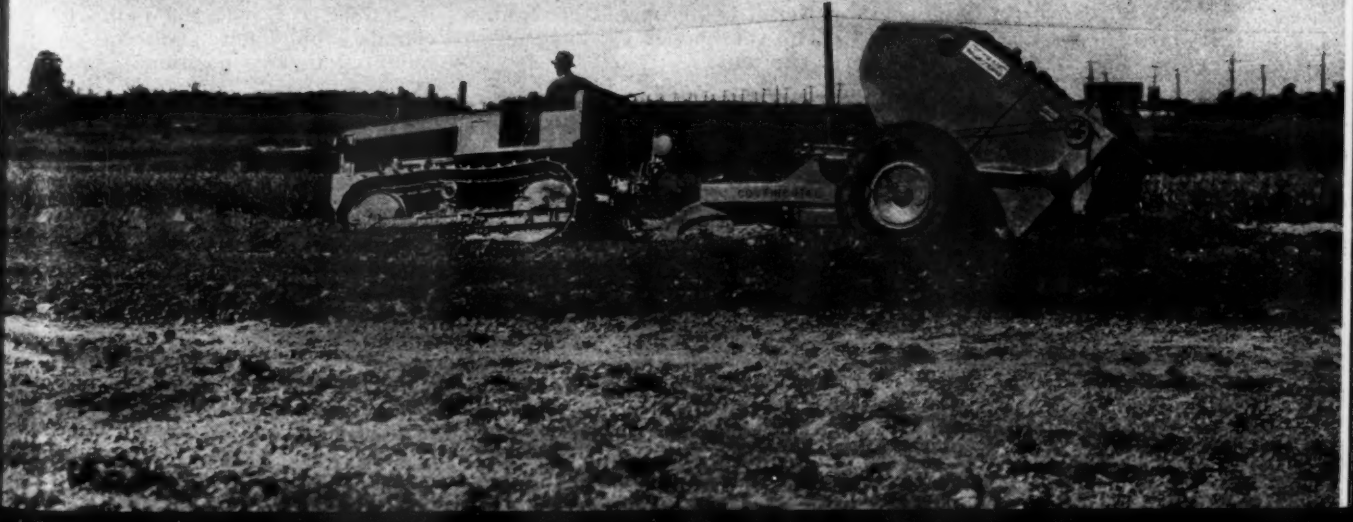


POWER FOR LOADING; SPEED FOR HAULING

This heavy, mucky soil is on the James Spencer & Sons Co. job near Houston, Miss. The "L-O" has ample power to load the 10-yard Gar Wood Scraper—also speed to cut down traveling time on the 800-foot haul.

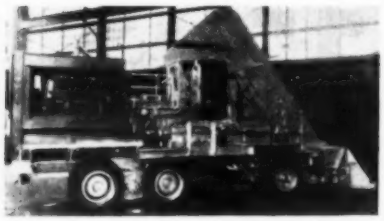
Below: Time saved to and from the fill means "cheaper-per-yard" dirt moving. This Allis-Chalmers "L-O" and 10-yard Continental Scraper are shown on the double overhead job of Kramp Construction Co. near Milwaukee, Wis.

MEANS EXTRA PAYLOAD *Gained!*



Equipment You Ought to Know About

(Continued from page 638)



even temperatures of the bitumen in the tank during the operation. The aggregate batcher is synchronized with the asphaltic material measuring pump, and every operation is so regulated that the materials are mixed properly.

The Buda Diesel Engine, Model 6-LD-909, used to power this plant is a 6-cylinder model, with 5¼" bore, 7" stroke, and 909 cu. in. displacement.

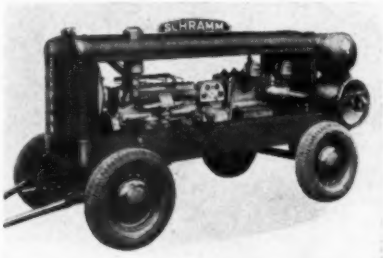
Iron Curb Armor

Malleable iron curb armor, patented and licensed by the Chicago Malleable Castings Company, Chicago, Illinois, provides, it is claimed, several important advantages, and is doing much to eliminate the dangerous, jagged curbing so frequently seen.

Made of tough, corrosion resisting mallable iron, the armor is adaptable to any kind of curbing, straight or curved, and regardless of curve radius. Straightaway sections are cast in 24-inch units, returns in 4-inch sections. This permits immediate installation after delivery since the armor is simply inserted in the concrete after pouring, and concrete tamped beneath the armor units. Leveling and finishing complete the job.

Schramm Compressor

Schramm, Inc., West Chester, Pennsylvania, are manufacturers of a new "Utility" Air Compressor. The straight-in-line cylinder



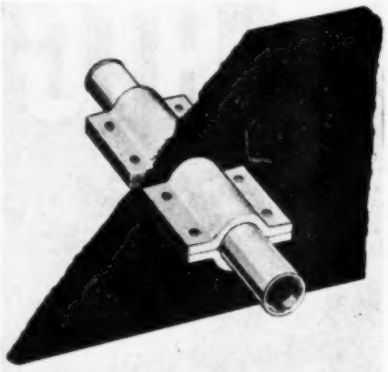
construction is used with force feed lubrication to all main bearings. Other features include electric self starting, self-aligning clutch between compressor unit and motor, mechanical intake valves, and water cooled engine and compressor.

Hopper Trailer

A new hopper trailer has just been built by the Hughes-Keenan Company, Mansfield, Ohio. These trailers come in six and eight yard capacities and are for use in transporting and spreading stone, gravel, slag, cinders, etc. They are reinforced and electric welded throughout. The flow of the material being spread is regulated by the hopper gate and speed of the unit.

T-G Bar

One of the most recent contributions to road building is the "T-G Bar," a device designed and manufactured by the Five-Way



Expansion Joint Company, Chicago, Illinois. The object of the device is to provide a connecting support at the joint between the concrete slabs to eliminate vibration during load transfer, and at the same time permit free lateral slab movement during temperature changes.

The T-G Bar consists of a pair of stress reducers, a metal sleeve, a dowel and two caps for closing the ends of the sleeves and seal a lubricant therein. An additional feature is a heavy coating of zinc. This galvanized coating has a definite affinity for concrete which makes a permanent bonding of the concrete with the stress reducers and the sleeve.

New F-M Pump

A two-stage built-together pump has been developed by Fairbanks, Morse and Company to operate against heads up to 500 ft.

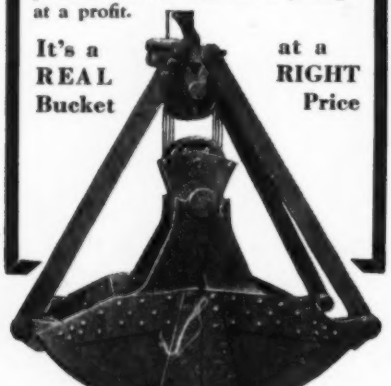
The new F-M pump is adapted for all classes of general pumping service with liquids low in viscosity and free from excessive foreign matter. No special foundation is required; the pump is complete in itself and can be mounted in any position.

You can tell by looking at its lower sheave design that a

HI-POWER

is a bucket that will keep the closing line UP out of the muck, save jammed sheaves and move yardage at a profit.

It's a REAL Bucket at a RIGHT Price



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Bucket Loaders — Portable Conveyors

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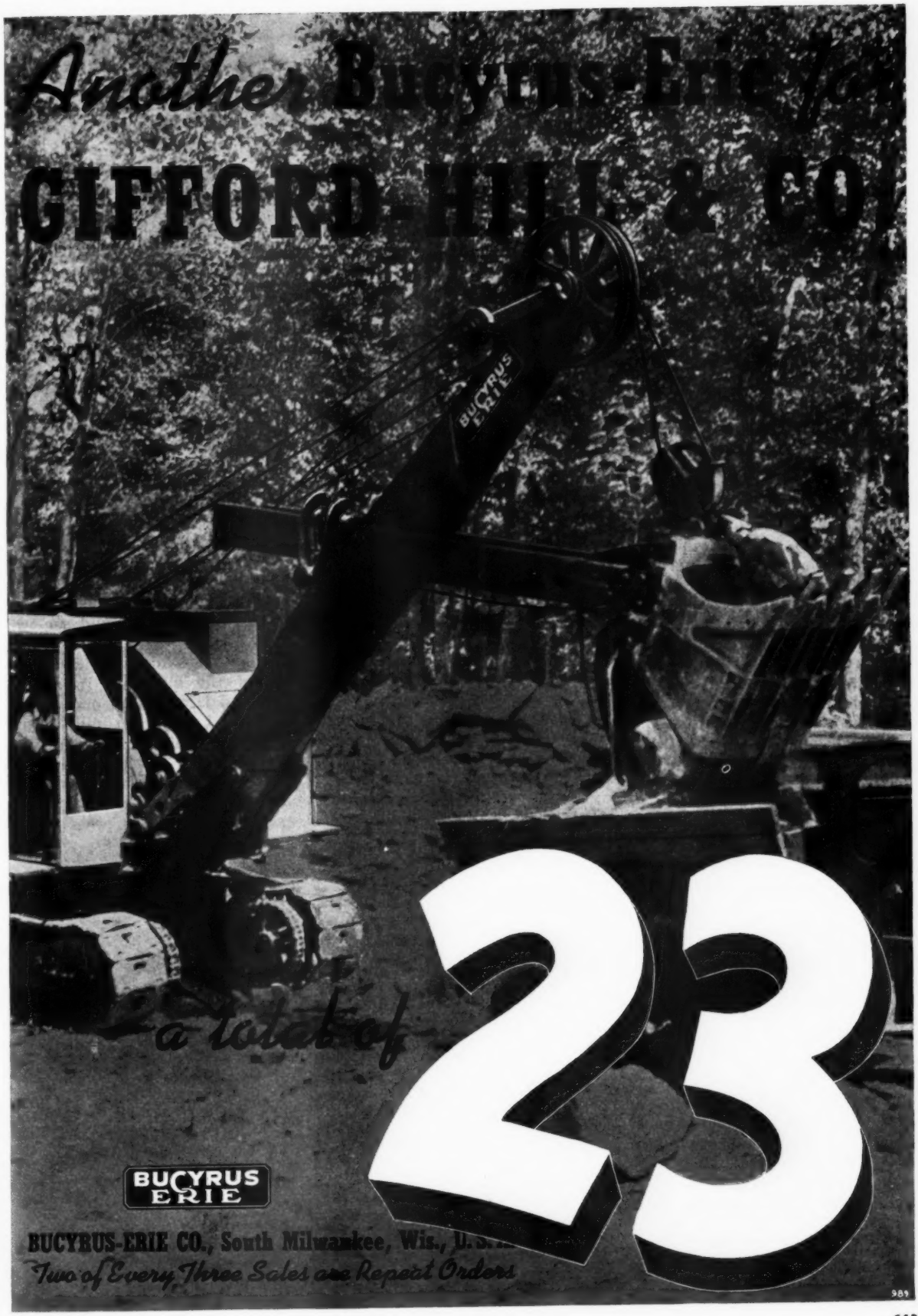

For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.

SMALL SHOVEL STORY

Duff & Ellberg, Pioneers in the use of 3/8-yard full revolving shovels, cover region around Warren, Pennsylvania with two machines and a trailer

FOR a good many years, prior to the Spring of 1934, the firm of Duff and Ellberg was in the gravel business in Warren, Pennsylvania. The firm owned its own trucks, but rented shovels for loading. Finally, it was decided that it would be more profitable to purchase a shovel, and Messrs. Duff and Ellberg looked around to see what machine best fitted their needs.

They decided on what was then a brand new type of machine, a Bucyrus-Erie 3/8-yard 10-B. Theirs was the second 10-B to be sold, and was put into operation in May, 1934. From that time until the spring of 1937, the machine scarcely had an idle moment, according to W. C. Duff. It didn't take long for Duff & Ellberg to discover that the speed and mobility of this new rig made a variety of small dirt-moving jobs both possible and profitable.

With improvement in business conditions, the number of small jobs in the territory around Warren increased to such an extent that one machine was inadequate to fill the demand. Consequently, Duff & Ellberg traded their "veteran" in on two new 10-Bs in the Spring of 1937. According to Mr. Duff, the old rig had proved highly satisfactory during its three years of service. It required a minimum of repair despite hard and constant use, and was still in good operating condition when traded in.

To take maximum advantage of the two new machines, a regular 10-B trailer was purchased along with them. With this unit, on which a shovel can be mounted in about 10 minutes and moved over the highways at truck speeds, Duff & Ellberg's two shovels now cover a wide area.

On a recent trip to Warren, the writer finally got hold of Mr. Duff—not without some trouble as he gets around as much as, and even more rapidly than, his shovels. He told us the story of his first 10-B, and we asked him how he liked the new ones. "Fine" he said.

"Do you keep 'em busy" we asked.

"Well, there's enough work around here so we could use two more."

When we said we'd like to see one of the machines in action, Mr. Duff told us that one was in Smethport, about 50 miles away. With Mr. Ellberg's son at the controls, this machine was digging a reservoir for Smethport. A 5000-yard job. "Straight, easy excavation—but the other 10-B's

● The shovel will load itself to the bottom of the car, clean it out, and move on a plank gangway to the next. Operator Clark Hartley keeps the State highway department trucks busy.

For safe OVERLOAD lubrication..and 10 TIMES MORE DIESEL SERVICE HOURS

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REG. U. S. PAT. OFF.

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Ten-ol is a new fused lubricant developed by Sinclair for all types of "Caterpillar" Diesels. It gives continuous top performance at lowest operating costs, and ten times more Diesel service hours than the finest straight mineral oil.

Order Sinclair Ten-ol, Sinclair Diesel fuel, and other Sinclair products from your local Sinclair office, or write Sinclair Refining Company (Inc.), 630 Fifth Ave., New York, N. Y.

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Sinclair TEN-OL is recommended as a "new outstanding Diesel engine lubricant" by Caterpillar Tractor Co.

doing an interesting job," Mr. Duff said.

So, following instructions, we drove down U. S. Route 6 to Sheffield where the second 10-B was unloading amiesite from gondola cars. The total job called for unloading 94 cars to State Highway Department trucks. The amiesite was being used for black top surfacing on Route 6 a few miles east of Sheffield.

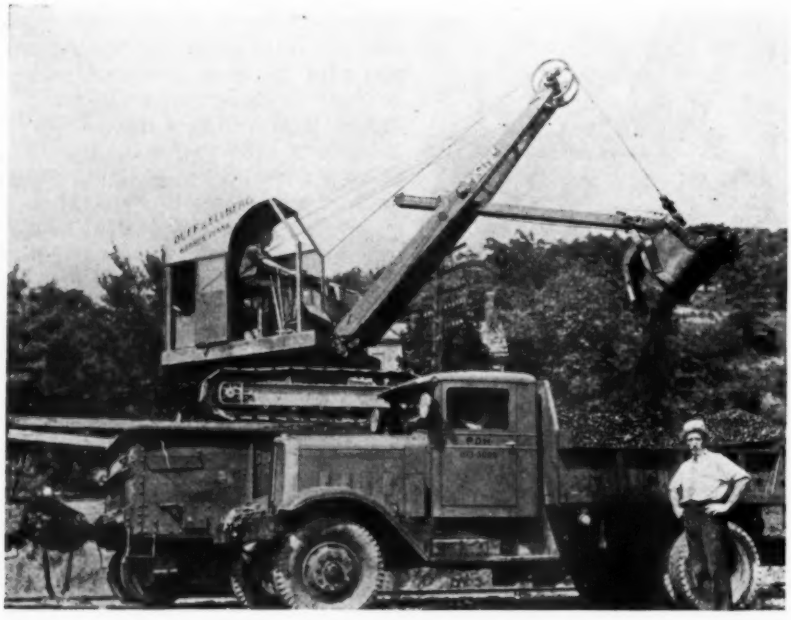
The majority of the cars were wooden end gondolas. With these, the ends were dropped, and the 10-B walked up from one end on a heavy plank "gangway". The amiesite was then unloaded over the sides with the 10-B working from the floor of the car. When one car had been emptied, the end of the adjacent car was dropped, and the 10-B run across the space between cars on a plank platform. Working on this system, the ⅜-yard shovel unloaded an average of 6 cars (running from 55 to 60 tons per car) per 10 hour day.

When we visited the job, Operator Clark Hartley was unloading one of three 75-ton steel-end gondola cars. Because the ends of these cars could not be dropped, the shovel had to work on top of the sticky amiesite, and dig itself down to the car floor. Until a working space has been cleared on the floor of this type of car, the 10-B works on planks, as shown in the accompanying illustrations.

● The car in the foreground is a "drop-end" gondola. The ⅜-yard shovel has loaded out the amiesite, walked up to its present position on a steel-end car.

No trouble was experienced in passing the amiesite through the regular ⅜-yard dipper, and operator Hartley told us he could clean off the bottoms of the cars "as nice as you please."

From this unusual job, the 10-B may be loaded on the trailer and speeded off to dig a cellar 50 miles away, or do any of the wide variety of jobs Duff and Ellberg find for their two machines throughout their section of the State. One thing is sure—the machine, and its companion rig, will be kept busy.



● The regular ⅜-yard dipper handles the sticky amiesite without difficulty. The machine has loaded out six 60-ton cars in a 10-hour day.

An Englishman was conversing with the clerk in the Ambassador Hotel.

"Here's a conundrum," said the clerk. "My mother gave birth to a child, it was neither my brother nor my sister, who was it?"

Englishman: "I give it up."

Clerk: "It was I."

Englishman: "Ha! Ha! Very clever, I must remember that." Said he, later at his club: "Here's a conundrum, old top. My mother gave birth to a child, it was neither my brother nor my sister, who was it? You can't guess? Do you give it up?

"Ha! Ha! It was the clerk at the Ambassador Hotel."

Mother: "Well, son, what have you been doing all afternoon?"

Son: "Shooting craps, Mother."

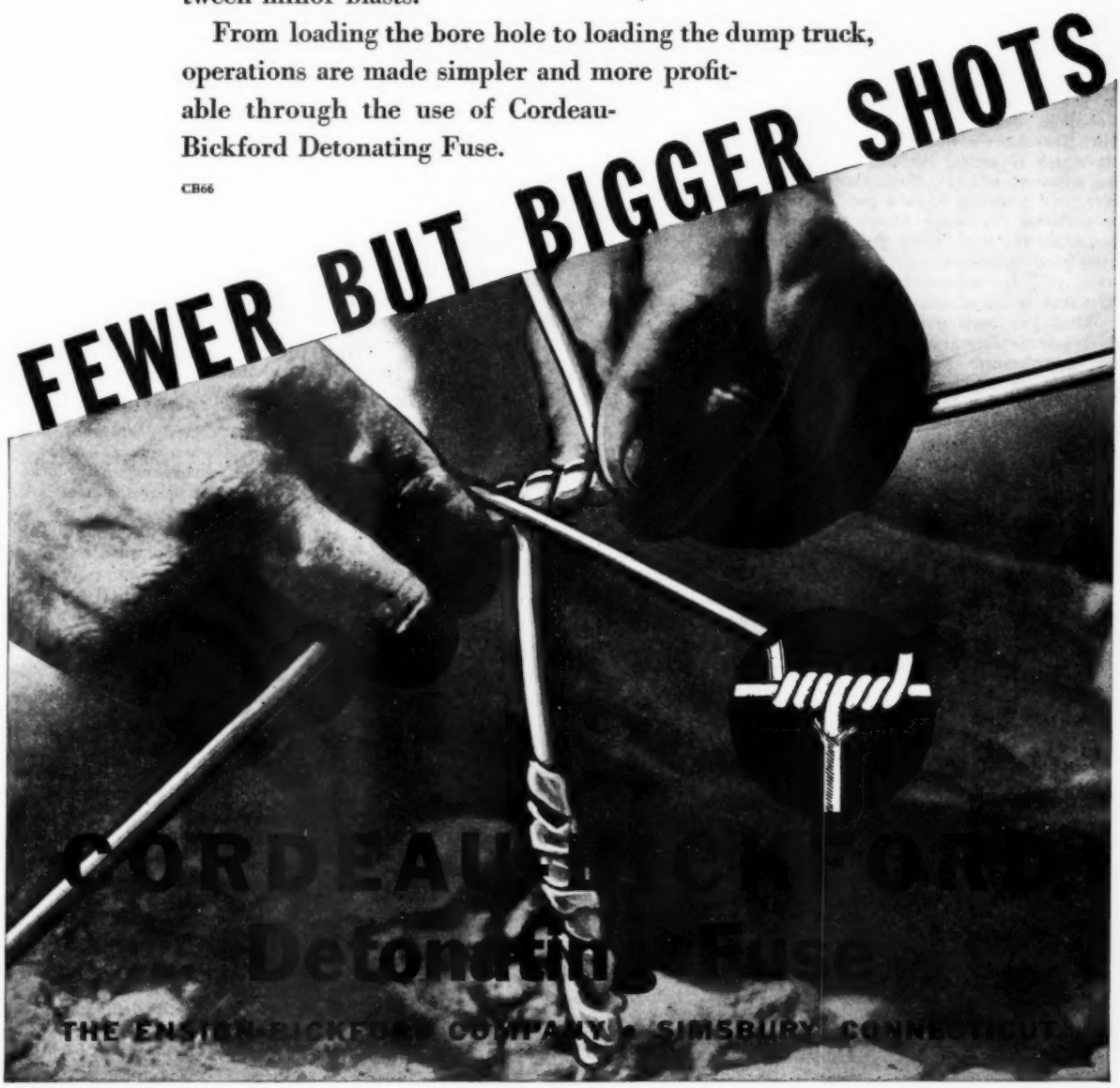
Mother: "That must stop. Those little things have just as much right to live as you have."

Equipment Moved Less Often

Detonation of charges with the use of Cordeau-Bickford Detonating Fuse is so complete and so dependable that there is almost no limit to the size of the blast, the depth of the holes, or the intricacy of the hook-up. There is an obvious saving in keeping the drills, compressors, lines, and other equipment on the job until all the holes are ready to be fired at one time. And there is a further saving in keeping the removal equipment continuously at work without having to move it back and forth between minor blasts.

From loading the bore hole to loading the dump truck, operations are made simpler and more profitable through the use of Cordeau-Bickford Detonating Fuse.

CB66



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Shots from the FIRING LINE

Coulee Foundation Dam Nears Completion

By HENRY W. YOUNG

The main hazards of construction on Grand Coulee dam have been met and conquered. There is every indication that the foundation dam will be completed in December of this year, at least 15 months ahead of scheduled time. Before this can be printed, bids will probably have been called for the completion of the dam to its full height for irrigation purposes. High water will never again be a menace to the job. More water than has ever been recorded can now be passed through the outlet tunnels and a few low gaps. Low water can now be passed through the tunnels alone.

By the same tokens, excavation work on the dam proper was almost completed in September. Soon, the only work for shovels will be in the gravel pit which is eating its way deep into the adjacent hillside. That alone, however, will continue to be a job of great proportions for some years to come, for, after the foundation dam has been completed 6,750,000 cu. yds. of concrete will be necessary to build the structure to its ultimate height.

What has been going on at Grand Coulee since January of this year may be summarized briefly as follows, touching the highlights only:

(1) River diverted in January, 1937 and east side construction area pumped out.

(2) Bed rock uncovered under main river channel and removed 8 or 10 ft. to solid rock.

(3) A gorge in the central section, 40 to 70 ft. wide was excavated to a depth of 80 to 90 ft. below general bed rock level. This delayed extending the two ends of the high trestle, thereby reducing rate of placing concrete because of restriction presented by difference of level between blocks. Therefore, there was little operation to take the output of the west side mixing plant.

● **Chief Engineer F. A. Banks points out Grand Coulee progress to President Roosevelt on the latter's visit to the dam.**

(4) But during that interval, the east side plant made a record of 9290 cu. yds. in one 24-hr. day. After both mixing plants were working at full capacity, they have together mixed as high as 15,844 cu. yds. in 24 hours, on August 28, 1937. On September 15 a record of 15,266 cu. yds. was made. Incidentally, the record at Boulder was 10,642 cu. yds. for all plants.

(5) Leak started March 2 in sand seam under "G" cell group forming junction between down stream cross river coffer dam and cribs in bucket timber crib of blocks 40 and 39. Reached as high as 30,000 g.m.p. in 24 hours. Remedied slightly by plugging "G" cell by boring to sand seam and pumping in grout. Completely remedied by placing row of emergency cells across corner and sealing enclosed area with various materials.

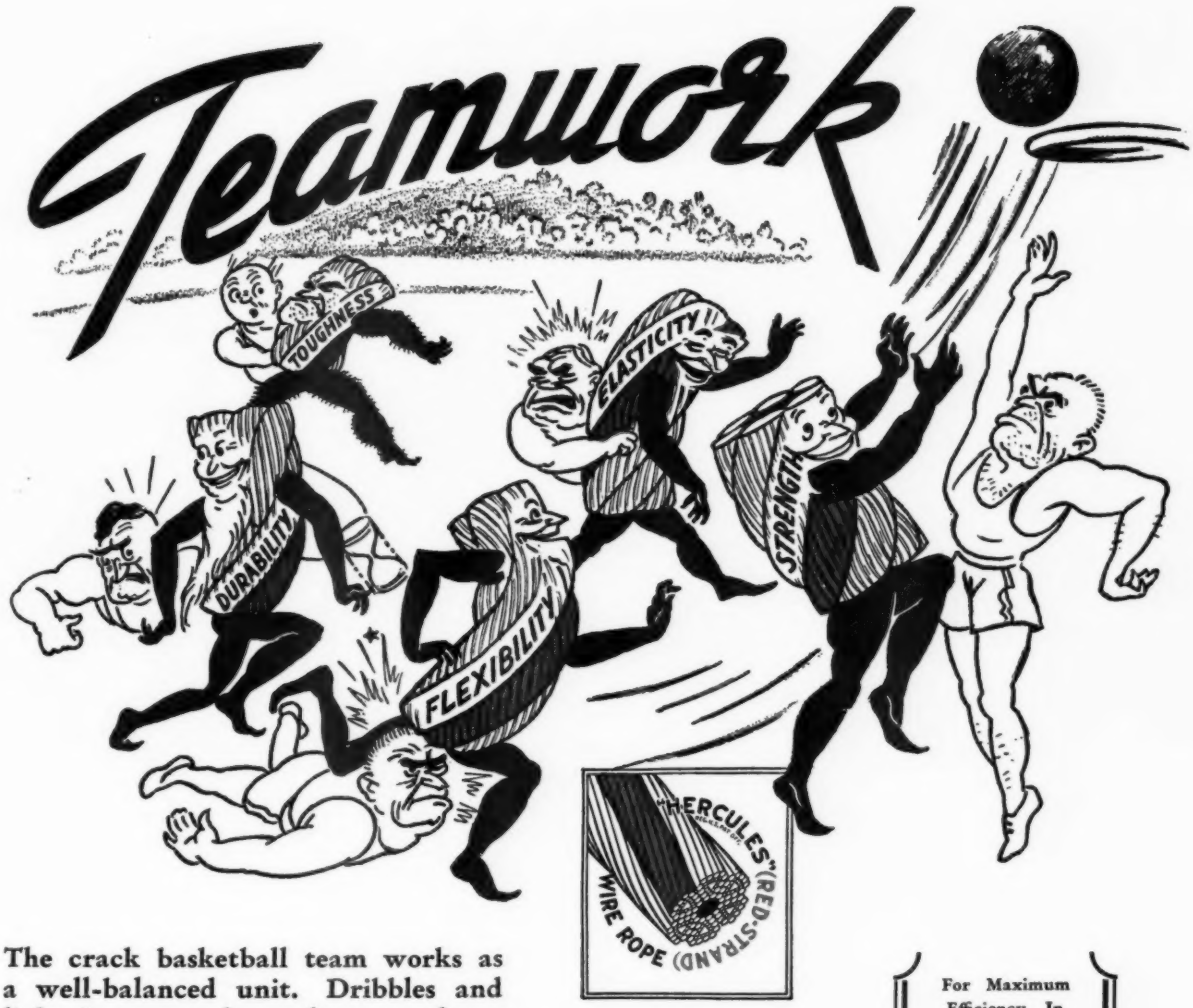
(6) Four cells of emergency group stood on rock to be occupied by toe of spillway dam and space approximately 100 by 200 ft. had to be left for later excavation of rock to about 25 ft. depth. Cells removed and this work completed in September.

(7) Top of cross river coffer dam taken off and timber cribs torn out with heavy shovels, and timber burned.

(8) Late September saw concrete being poured all over mid-river and east side sections and preparations made to close gaps in west side diversion. Maximum rate of laying concrete had been reached.

What shovels and draglines had done and what was left for them to do as of

● **The foundation dam at Grand Coulee nears completion, and plans for completing the high dam are ready for the stage of advertising for bids. Including sand and gravel pit work, over 30,000,000 yards of excavation has been necessary at Grand Coulee.**



The crack basketball team works as a well-balanced unit. Dribbles and lightning passes from player to player form the "set-up" for shooting the basket . . . impossible, unless each man does his part.

Good Wire Rope, too, must work as a well-balanced unit. Those essential characteristics of strength, elasticity, durability, flexibility and toughness must be perfectly coordinated—each helping the other—to make an enduring, economical wire rope. And none of these five essentials should be more important than the others!

This *balanced* construction is the reason "Hercules" (Red Strand) Wire Rope is so efficient — so economical — and so long lasting. It's wire rope that offers you the advantages of "teamwork" over the weakness of "grandstand" play.

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June 25, 1937, is indicated in the following tabulation, according to figures furnished by the Bureau of Reclamation.

To June 25, 1937, on dam site and vicinity and exclusive of gravel pit operations, there had been excavated a total of 18,178,218 cu. yds. common, and 1,243,308 cu. yds. rock.

There was left on the above date: General excavation 15,000 cu. yds.; East Abutment, 40,000 cu. yds.; Under toe of spillway, 18,000 cu. yds.; Pump house, 30,000 cu. yds.

To June 25, 1937, all excavation in the sand and gravel pit had been 9,000,000 cu. yds.

Schley Appointed New Engineer Chief

On October 18, Julian L. Schley became Chief of Engineers of the U. S. Army, with the rank of Major General, succeeding General Markham.

Major General Schley has first-hand knowledge of the Mississippi flood control problem, having been in charge of the New Orleans engineering district in 1916 and 1917. Born in 1880, his first post upon graduating from West Point was in the Philippines. From 1905 to 1909 he served with the army of pacification in Cuba. Later, he was assistant to the Engineer Commissioner of the District of Columbia, becoming executive officer of the first Public Utilities Commission in 1913.

Many other important positions, the best known of which was as engineer of maintenance and Governor of the Panama Canal, have given General Schley a splendid background for his new work. It is expected that flood control projects under the Overton Act will be among the first sizable work undertaken under his direction.

● Bonneville power will be administered and marketed by James D. Ross, recently appointed to the job by Secretary Ickes. This view shows Columbia Construction Company forces working on the Bonneville spillway and cofferdam.

Ross Appointed New Bonneville Administrator

James Delinage Ross has been named as administrator of the Bonneville project. Under legislation passed at the last session of Congress, Mr. Ross will have charge of administering transmission and marketing of power produced at Bonneville Dam, and also of the construction of necessary supplemental facilities. He will be directly responsible to the Secretary of the Interior.

Mr. Ross developed the City Municipal and Power System of Seattle, and is a Commissioner of the Securities Exchange Commission.

Coming Conventions

The 1938 Road Show and American Road Builders Association Convention being held in Cleveland, Ohio, January 17-21, promises to be the biggest ever, according to all reports.

In addition to a comprehensive program of meetings, those in attendance at the convention will have the opportunity to see the most spectacular exhibit of road building equipment and materials ever assembled. Dual-drum pavers will be exhibited for the first time, along with other types of pavers, mixers, finishers, graders, rollers, tractors, trucks, compressors, shovels and draglines, crushers, etc.

The annual convention and machinery exhibit of the National Crushed Stone Association will be held in Cincinnati, Ohio, January 24 to 26 inclusive. Headquarters will be the Netherland Plaza Hotel.

The same hotel will be the scene, on February 1 to 3 inclusive, of the annual convention of the National Sand & Gravel Association.

Advance indications point to an attendance of over 700 highway officials, engineers and asphalt technicians at the Eleventh National Paving Conference, to be held in Memphis, Tennessee, December 6, 7 and 8.

Major themes of the Conference will be Highway Economics, Subgrade Stabilization, Asphalt Highways and

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Christmas Seals
are here again!
They protect your home from Tuberculosis

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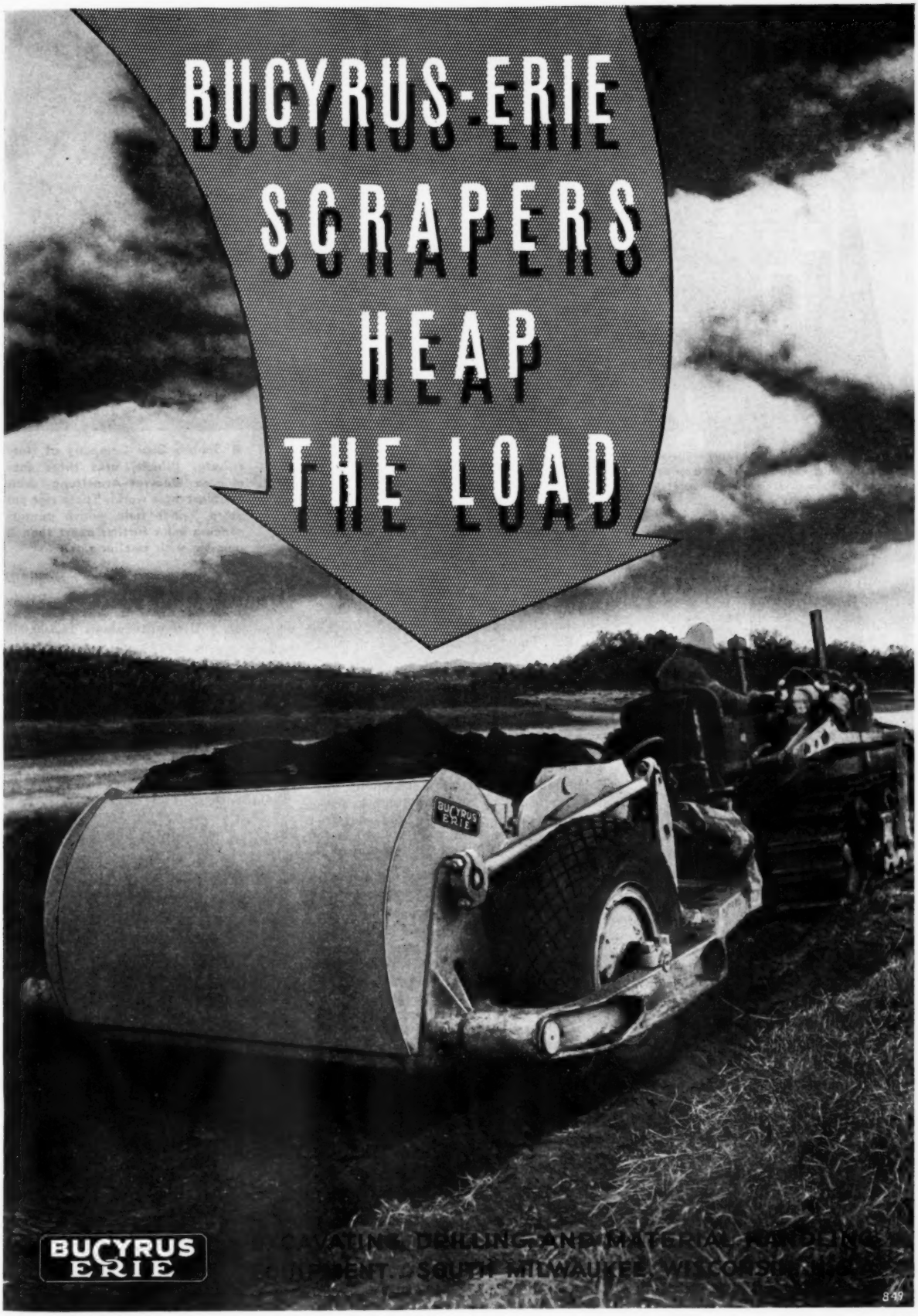

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Published once a year—the only technical reference book, condensed catalogue, and trade directory in the field. Price $10.00

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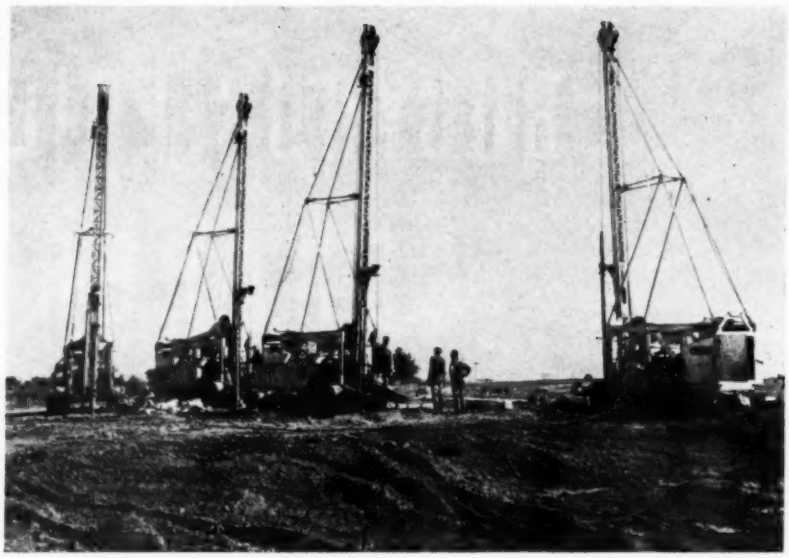

● Sahara Coal Company of Harrisburg, Illinois, uses these four modern Bucyrus-Armstrong drills for blast-hole work. These rigs put down 9-inch hole, which permits spacing holes further apart than is possible with smaller rigs.

Asphalt for Airport Surfaces, River and Harbor Protection, Country Highway Sidewalks, Soil Erosion Control and Moisture Conservation. In addition, three technical sessions will introduce reports and papers of the Association of Asphalt Paving Technologists.

The 38th annual convention of the International Acetylene Association will be held at the Tulwiler Hotel in Birmingham, Alabama, November 10, 11 and 12. The program will be divided between technical sessions and the round table discussions which proved so successful at last year's convention.

The 17th annual meeting of the Highway Research Board of the National Research Council will be held in Washington, D. C., November 30 to December 3. Papers and committee reports relating to highway finance, economics, design, materials and maintenance, construction, soils, roadside development, and safety will be presented.

French Lick, Indiana, will be the scene of the annual convention of the Structural Clay Products Institute on November 2, 3 and 4. Present program of SCPI, and plans for expansion in 1938 will be the theme of the convention, with industry leaders pointing out what's ahead for the coming year.

New Pennsylvania Highway

The recently created Pennsylvania Turnpike Commission has been authorized to issue $50,000,000 worth of bonds for construction of a new "limited-way" highway between Pittsburgh and Harrisburg. This road will consist of two 22-foot concrete sections separated by a planted center section not less than six feet wide. It will be 164½ miles long, and will follow the grade of the abandoned South Penn Railroad for most of the distance.

Nine former railroad tunnels, about 62 per cent excavated, totalling 39,609 feet, will be utilized for the new highway. These tunnels at present range from 26 to 28 feet in diameter. The whole job will require about 14,700,000

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SOUTH MILWAUKEE, WISCONSIN, U.S.A.

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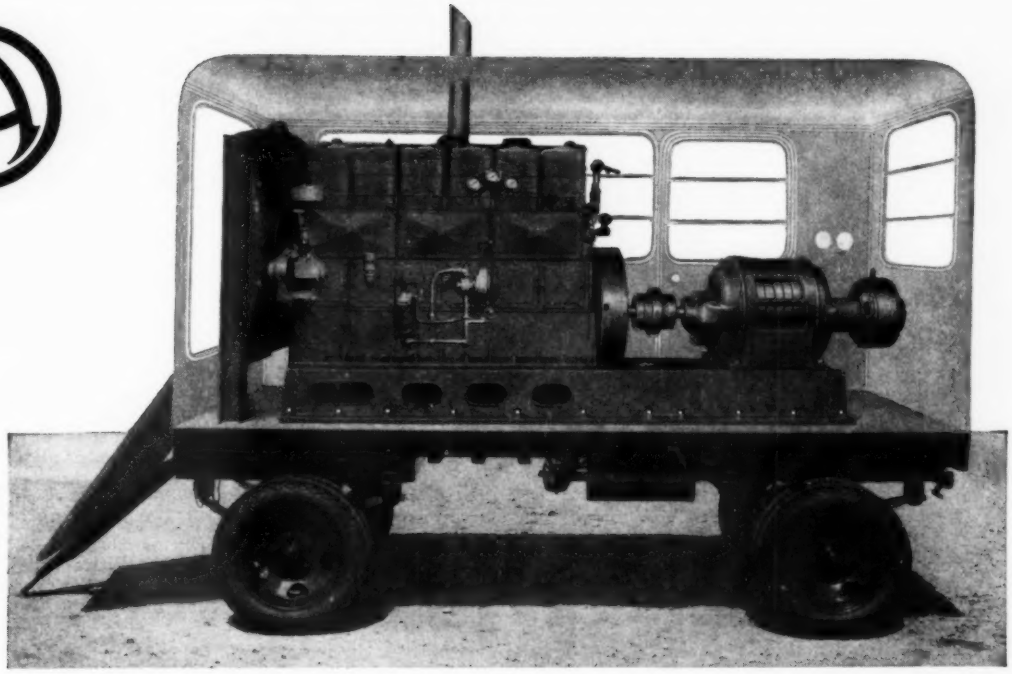
A New Portable Diesel-Electric Plant for Road Contractors



THIS is the new portable Atlas Diesel-Electric Unit especially adaptable to the work of road contractors inasmuch as it gives them the desired mobility, coupled with the flexibility of electric power and ease of control.

One road contractor, who uses such a unit to operate his rock crusher, recently completed a job on Friday night, disassembled his crushing plant, moved to another location 150 miles away and was all set up and ready to run on Monday morning.

The unit pictured above consists of a 6 cylinder, 9" x 10½", 200 H.P. fully enclosed and dustproof Atlas Diesel direct connected to a 125 K.W. generator and exciter, mounted on a common base. The power plant is carried on a standard Fabco four-wheel trailer as illustrated.

If you are contracting projects far removed from the high lines, the portability, flexibility, dependability and economy of this Diesel-Electric plant will appeal to you. Your inquiries are solicited and will be given prompt attention.

ATLAS IMPERIAL DIESEL ENGINE COMPANY

Oakland, California — Mattoon, Illinois

ATLAS IMPERIAL

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yards of excavation, exclusive of remaining tunnel work. An estimated 770,000 tons of sand, 1,200,000 tons of stone and slag, 50,000 tons of steel, and 392,000 tons of cement will be needed.

Surveys of rights-of-way are now being made, but bids for major work will probably not be called for until 1938.

Reclamation Funds for 1938

Funds appropriated for construction work by the Bureau of Reclamation during the fiscal year 1938 total $9,850,000. In addition to this, unexpended balances from appropriations made for the fiscal year 1937 are made available for 1938, raising the total to $11,016,600.

These funds are divided as follows:

Gila Project, Arizona	$ 700,000
Salt River Project, Arizona	500,000
Orland Project, California	35,000
Colorado Big Thompson Project, Colorado	900,000
Pine River Project, Colo.	500,000
Boise Project, Idaho, Payette Division	1,000,000
Sun River Project, Montana	300,000
Carlsbad Project, N. Mex.	200,000
Owyhee Project, Oregon	500,000
Klamath Project, Dryon, California	125,000
Belle Fourche Project, S. Dakota	130,000
Ogden River Project, Utah	250,000
Provo River Project, Utah	750,000
Yakima Project, Washington Roza Division	1,500,000
Caspar-Alcova Project, Wyoming	650,000
Riverton Project, Wyoming	200,000
Shoshone Project, Wyo.	710,000
Colorado River Basin investigations	150,000

These funds are in addition to appropriations for investigation, operation and maintenance of various Bureau of Reclamation projects.

Grand River Project

An allotment of $20,000,000 to the Oklahoma Grand River Dam Authority has been announced by PWA. This will be used for construction of a multiple-purpose flood control, irrigation and power dam on the Grand River near Pensacola, Oklahoma. The project will include a 20,000 kw. hydro-electric plant capable of producing 170,000,000 kw.-hours of firm power a year. Surveys have indicated an ample market for this power in oil and coal fields, lead and zinc mines, and the surrounding urban area.

Allis-Chalmers Expansion

The Tractor Division of Allis-Chalmers Manufacturing Company announces an expansion program costing approximately $4,000,000. This program consists of additional buildings and equipment at the West Allis Works for tractor production; buildings and equipment at the LaCrosse implement plant, and additional equipment at the Springfield and LaPorte plants. These new facilities will give Allis-Chalmers Manufacturing Company a greater production capacity than it has had in the past.

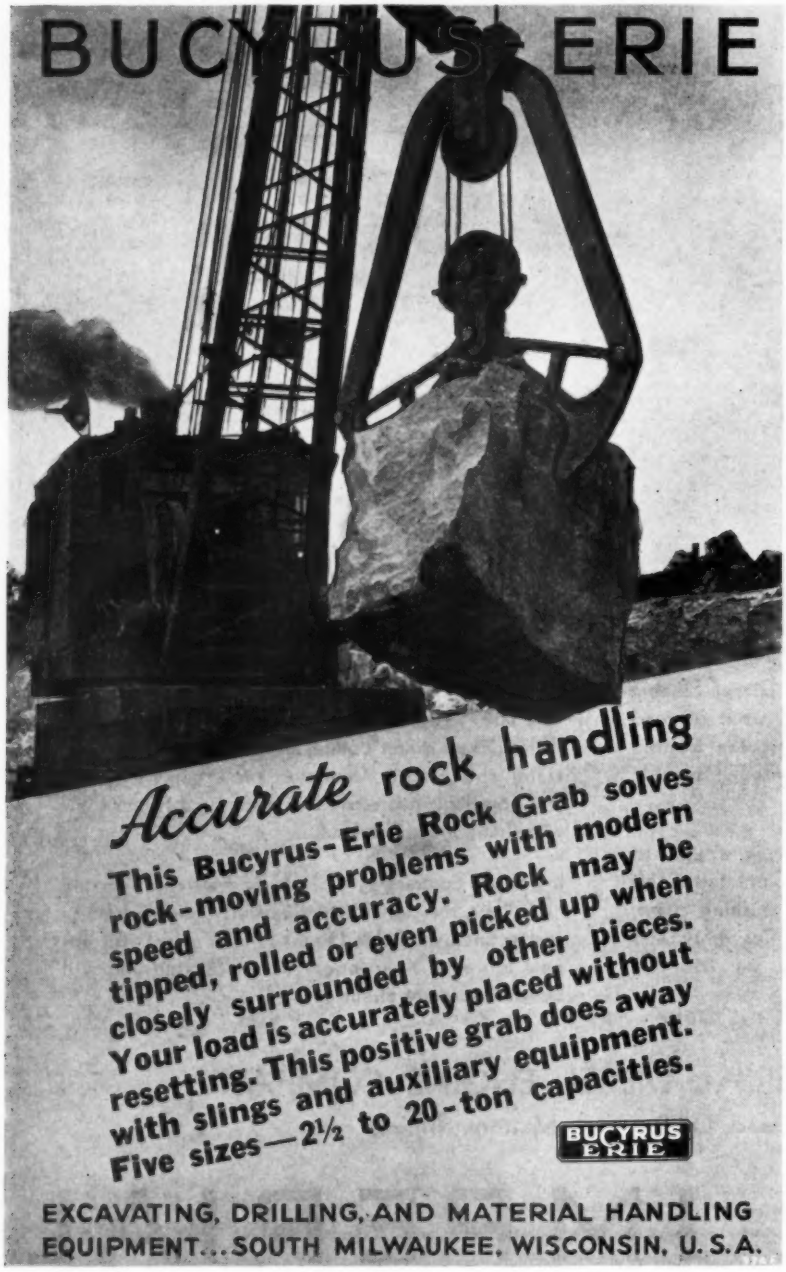
No More PWA Allotments

"A decreasing need" for the stimulus to industry provided by PWA projects has led the President to announce that no further allotments will be made, for the time being at least. Although there are still funds available, the "passing of the economic extremity" means the end of the program for non-federal projects resulting from the Congressional extension of PWA, despite the number of applications still on file.

Since the creation of PWA in 1933, 10,605 non-federal projects, costing $2,759,173,000 have been financed. Of these, 7,845 have been completed, creating 661,089,000 man-hours of direct labor, and costing $1,208,540,000.

Approval has been given to 1,253 projects since the extension of PWA in 1937. These totaled $113,035,000 in grants and $58,006,000 in loans.

Funds remaining in PWA reserves will be used to continue projects now under way, which must be completed by July 1, 1939, when PWA legally comes to an end. In some cases these funds will not be sufficient for completion of the job, which must then be


BUCYRUS-ERIE
Accurate rock handling
This Bucyrus-Erie Rock Grab solves rock-moving problems with modern speed and accuracy. Rock may be tipped, rolled or even picked up when closely surrounded by other pieces. Your load is accurately placed without resetting. This positive grab does away with slings and auxiliary equipment. Five sizes—2½ to 20-ton capacities.
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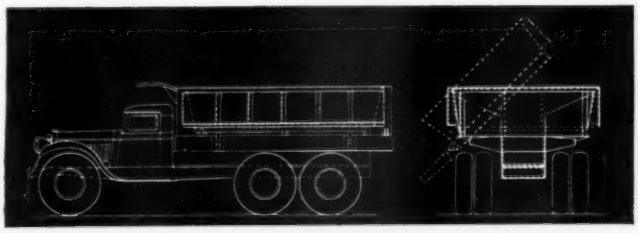
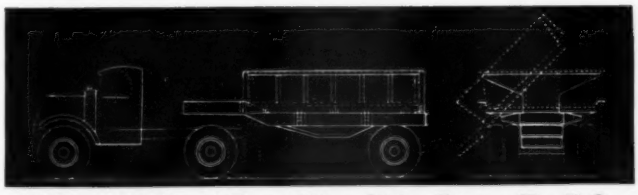


12-Yard Two-Way Side-Dump Truck Body Controlled From Cab

Will dump to either side. Handles every size of chunk. Discharges faster than conventional end dump trucks. Capacities up to 30 tons.



25-Ton 12-Yard Two-Way Side-Dump Trail Car

Handles the largest chunks a shovel dipper can load. Special drop door design provides extra clearance for fast get away from the dump. The pivotal design of the Two-Way Side-Dump mechanism requires very little lifting effort for quick discharge. As the hydraulic ram starts the lifting operation the weight of the load helps to tip the car floor to an angle of 45 degrees. The speed and safety of this discharge feature has been proved on thousands of Western Side-Dump Railroad Cars. Cab controlled.

Low Cost Operation

● In its line of trail cars and dump bodies Austin-Western has successfully combined the endurance of the famous "Western" Dump Car with the speed and low operating costs of pneumatic tired haulage equipment.

The entire chassis has been built to take the shocks of direct shovel loading and rough roads: heavy duty axles and springs, cast steel wheels, steel-wood-steel floor, and specially designed fifth wheel. Tough alloy steels are used to reduce dead weight in the body construction providing top pay load hauls at motor truck speeds. Years of continuous operation under the most punishing conditions have demonstrated the dependability of Austin-Western haulage equipment.

Write us for construction details and operating data.

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ROAD MACHINERY COMPANY
1821 BARROWS STREET, AURORA, ILLINOIS

· Austin-Western ·

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financed by regular Congressional appropriation.

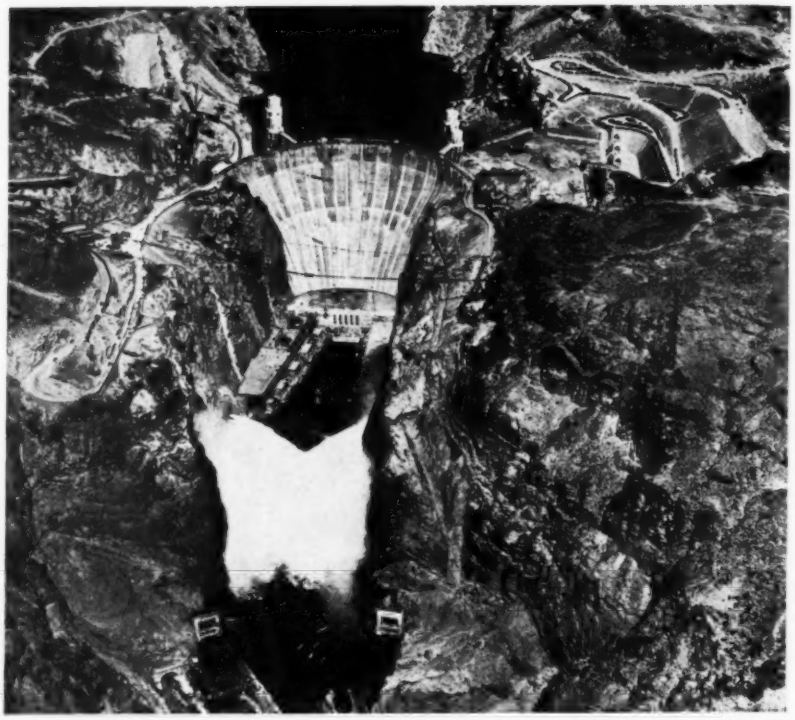
Also, the field staff of PWA is being reorganized to effect savings in administrative costs. November 1 all existing state offices will be closed, and PWA supervision given to a central office in each of 7 districts.

Willamette Valley Projects Recommended

The expenditure of $56,875,000 for the development of resources in Oregon's Willamette Valley has been recommended by U. S. Army Engineers. $46,000,000 of this will be the government's share and $10,000,000 the share of local interests. The project will consist of seven dams, a 6-foot channel to the mouth of the Santian River, a 5-foot channel to Albany, and reconstruction of Oregon City locks.

The dams and reservoir projects proposed are: Dorena on Row River, $3,077,000; Cottage Grove on Willamette River, $1,334,000; Lookout Point on the Willamette, $18,452,000; Quartz Creek on McKenzie River, $13,583,000; Fern Ridge on Long Tom River, $2,388,000; Sweet Home on South Santiam River, $6,889,000; Detroit on North Santiam, $6,752,000.

Other proposed improvements are: Willamette Falls Navigation Locks, $2,500,000; Open River navigation improvements, $1,100,000; Fish Conservation facilities, $800,000.



● With completion of the dam itself a thing of the past, attention has been centered on power production at Boulder Dam. Recent contracts for power equipment total over $2,000,000. This picture shows the spectacular test of all 12 needle valves.

Slackline lifts gravel from deep under water to top of screening plant.

Scraper drags material from river and builds a long, solid revetment.

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LONG RANGE MACHINES

Use a Sauerman Drag Scraper or Slackline Excavator to reduce your equipment cost and operating expense on such work as the following:

—*making long cuts and fills*
—*canal and levee construction*
—*cleaning reservoirs*
—*digging gravel from rivers, hills and pits*
—*stockpiling and reclaiming gravel, coal, ore, etc.*
—*and other long haul work.*

A Sauerman machine has a great advantage over other types of equipment on work of the above description because it is able to reach any distance up to 1500 ft. and dig, haul and place the materials in one operation.

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Here Is a Bargain
in used excavating equipment

(taken from page 664)

OSGOOD—VICTOR—GAS 1½ YD. SHOVEL & Clamshell. Shovel boom 23'. Clamshell boom 50'. Wisconsin D-4—6 cylinder 5¾"x6½" engine. Reported excellent condition. Located Minneapolis. Box 1111-SS.

For other bargains in shovels, draglines, cranes, locomotives, trenchers, and miscellaneous contractors' equipment turn to pages 662 to 666.

The largest listing of Used Equipment offered by any Publication Serving the Excavating Industry.

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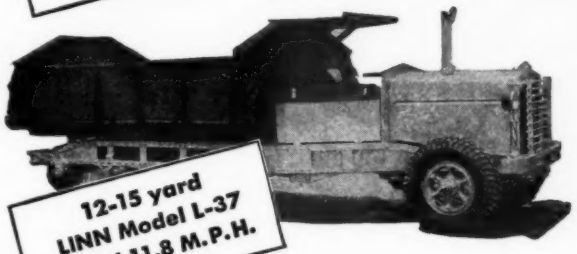
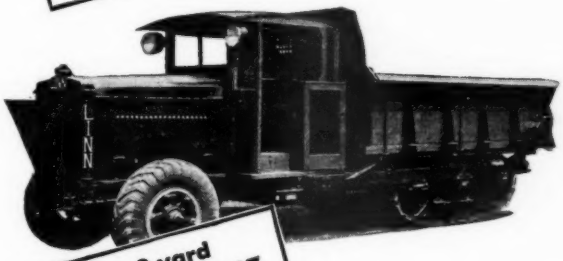
20-25 yard
LINN Model 37-T
Semi-Trailer



12-15 yard
LINN Model L-37
Speed 11.8 M.P.H.



8-9 yard
LINN Model 6-37
Speed 7.9 M.P.H.

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For your convenience in writing to The Linn Manufacturing Corporation, you will find a card bound in this issue.

Dragline Parade

(*Continued from page 628*)

see that it is clear of mud and dumps clean rock on the bed, fulfilling the contract which calls for "rock on rock." It is estimated that the blind digging of the rock under about eight feet of water is being done at the rate of a thousand yards per shift.

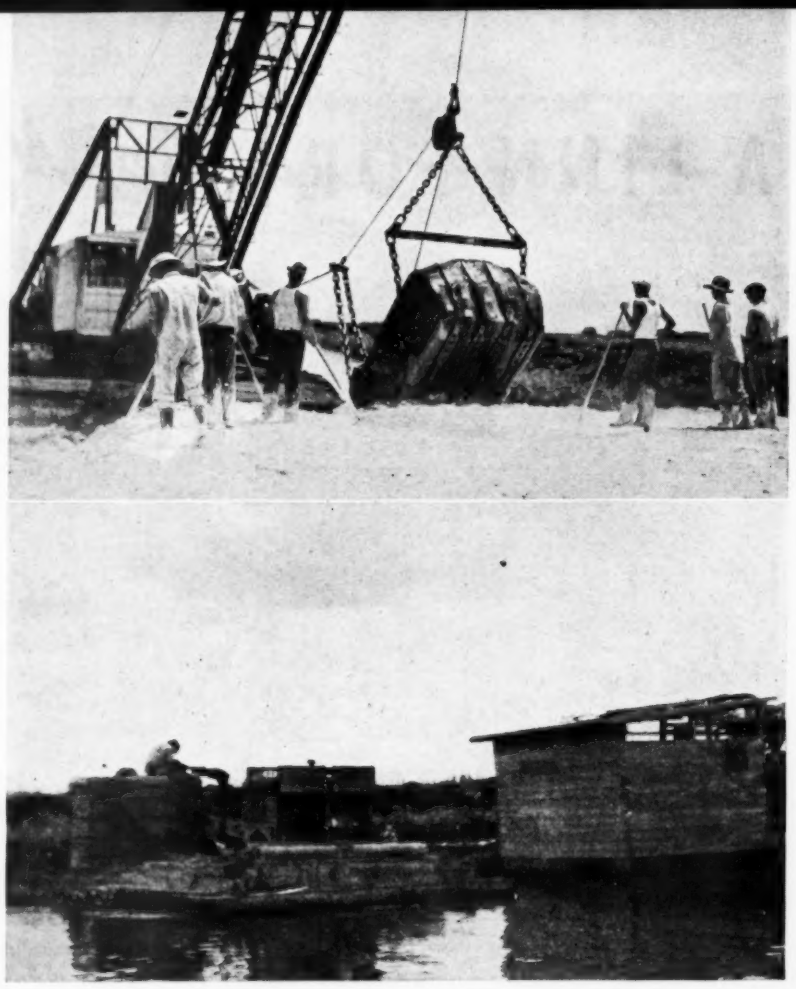
Another feature of the road building is that inspection of the rock bottom of the roadbed when it has been cleared by the 37-B must be provided before the rock is dumped in from the canal. As soon as the muck is scraped off the rock the road fills almost immediately with surface water. This must be pumped out so the inspectors can see the rock. To pump out these sections of the roadbed a 40 H.P. International F-12 engine is used to operate a Crouch 12-inch centrifugal pump.

Florida rock is commonly classified as limestone and soft. However, this general classification is misleading because some of it is composed of a lower shell content and contains streaks that are very hard and most of it can only be handled by dynamiting. The geology of the hardpan strata that lies under the deep muck of the Florida Everglades is more properly termed a consolidation of limestone, flint, coral and marl. The color of the material in this section is almost pure white.

While Florida engineers have built roads from Florida rock under such classifications as shell, coquina and limestone for many years, it has principally been used for hard surfacing and this road is the only road in the Everglades to be excavated to the hard pan for a foundation for the road.

Following up the 45-B comes the Bucyrus-Monighan 5-W walker. This big machine winds up the system of operations by dumping the final rock which makes the grade of the road, digging it from the bottom of the canal. Output of this rig is about 80,000 yards per month.

All draglines on this job must work from large pine mats because of the extremely soft muck. The mats are nine inches thick and run about ten by twenty feet.



● **Above: Another load from the 4½-yard bucket goes into the fill. The waiting crew will give it final grade. Below: A bucket gets welded at the floating shop.**

They are made of 3x6 Florida pine and laminated in large sections. Mats are advanced in sections as necessary by the draglines. Daily inspection, including oiling and greasing at the end of each 8-hour shift, features the maintenance system. Repairs, except emergency, and overhaul, are made each Sunday.

Seven Kohler light plants keep the job well lighted at night and large search-lights have been installed on all the dragline booms. Other equipment is gas and electric welding equipment. The gas equipment consists of Mecco and Smith gauges and Oxweld and Mecco torches. The electric welder is a 250 ampere Westinghouse.

The Auchter job is a real all water job. The shop is built on a barge and all supplies and fuel come into the job by boat. Gasoline and fuel oil drums are on barges. About the only things kept on dry land are the powder magazines which have been stationed at safe distances on the road grade north of the 5-W. Because sanitary hazards make a camp on the job impractical, men are transported by truck and boat from South Bay.

The headquarters of The Geo. D. Auchter Co., is Jacksonville, Florida. Geo. D. Auchter is president of the company and James T. Monahan is vice president. General superintendent in charge of the Everglades contract is F. J. Balthazor.

The contract calls for completion of the contract by June, 1938, and it is estimated that the job is on schedule at the present time.

For the State Road Department (Arthur B. Hale, Chairman, and J. H. Dowling, Chief Engineer), E. C. DeGarmo is Division Engineer and Earl Hendrickson Project Engineer.